2015 OU2 GROUNDWATER INVESTIGATION RE123D1, RE123D2, RE123D3 (VPB157) INSTALLATION REPORT

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT (NWIRP)
SITE 1 OU2
BETHPAGE, NY

Prepared for:

Department of the Navy
Naval Facilities Engineering Command, Atlantic
9324 Virginia Avenue
Building Z-144
Norfolk, Virginia 23511

February 2016

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9324 Virginia Avenue
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Prepared by:

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Contract Number: N62470-11-D-8013
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List of Acronyms and Abbreviations

AOC	Area of Concern
bgs	below ground surface
COR	Continuously Operating Reference
EPA	Environmental Protection Agency, United States
ft	feet
GOCO	Government-Owned Contractor-Operated
GPS	Global Positioning System
IDW	Investigation Derived Waste
IR	Installation Restoration
Katahdin	Katahdin Analytical Services
NAD	North American Datum
NAVD	North American Vertical Datum
NAVFAC	Naval Facilities Engineering Command
NG	Northrop Grumman
NTU	nephelometric turbidity units
NWIRP	Naval Weapons Industrial Reserve Plant
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
ONCT	On-site Containment Treatment System
OU	Operable Unit
PCBs	Polychlorinated Biphenyls
POTW	Publicly Owned Treatment Works
PPE	Personal Protective Equipment
PVC	Polyvinylchloride
SAP	Sampling and Analysis Plan
SVOC	Semivolatile Organic Compounds
TCE	Trichloroethene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TOC	Total Organic Carbon
UFP	United Federal Programs
US	United States
VOC	Volatile Organic Compounds
VPB	Vertical Profile Boring

1.0 PROJECT BACKGROUND

Resolution Consultants has prepared this Data Summary Report for the Naval Facilities Engineering Command (NAVFAC), Mid-Atlantic under contract task order WE15 Contract N62470-11-D-8013. This report describes the installation of three monitoring wells and one initial quarterly groundwater monitoring event (specifically at the Vertical Profile Boring [VPB] 157 location) in 2015 for the Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage Operable Unit (OU) 2 Site 1 offsite plume. NWIRP Bethpage is located in east-central Nassau County, Long Island, New York, approximately 30 miles east of New York City (Figure 1).

1.1 Scope and Objectives

This report provides information on the installation of RE123D1, RE123D2 and RE123D3. The purpose of this investigation was to ascertain the presence and level of contamination in the vicinity of the On-site Containment Treatment system (ONCT), between recovery wells 17 and 18. The locations of RE123D1, RE123D2 and RE123D3, VPBs and monitoring well locations are shown in Figure 2.

The field investigation included completing three monitoring wells, well development, soil/groundwater analysis, groundwater grab samples, and surveying. Field tasks were conducted in 2015 in accordance with the *United Federal Programs Sampling and Analysis Plan (UFP SAP)*, Bethpage, New York (Resolution, 2013a). In addition, the work adhered to the following UFP SAP Addendums: *Groundwater Sampling Using Low Stress (Low Flow) Purging and Sampling Protocol* (Resolution Consultants, 2013b) and *Installation of Vertical Profile Borings and Monitoring Wells* (Resolution Consultants, 2013c).

Documentation of these activities is included in Appendix A of this report.

1.2 Site History

NWIRP Bethpage is in the Hamlet of Bethpage, Town of Oyster Bay, New York. Since its inception in 1941, the plant's primary mission was the research, prototyping, testing, design, engineering, fabrication, and primary assembly of military aircraft. The facilities at NWIRP included four plants used for assembly and prototype testing, a group of quality control laboratories, two warehouse complexes (north and south), a salvage storage area, water recharge basins, the Industrial Wastewater Treatment Plant, and several smaller support buildings.

The Navy's property originally totaled 109.5 acres and was formerly a Government-Owned Contractor-Operated (GOCO) facility that was operated by Northrop Grumman (NG) until September 1998. Prior to 2002, the NWIRP property was bordered on the north, west, and south by current or former NG facilities, and on the east by a residential neighborhood. By March 2008, approximately 100 acres of NWIRP property were transferred to Nassau County in three separate actions. The remaining 9 acres and access easements were retained by the Navy to continue remedial efforts at Installation Restoration (IR) Site 1 – Former Drum Marshalling Area and Site 4 – Former Underground Storage Tanks (Area of Concern [AOC] 22). A parcel of land connecting the two sites was also retained. Currently, the 9-acre parcel of NWIRP is bordered on the east by the residential neighborhood and on the north, south, and west by Steel Equities; however, a small portion is still owned by Nassau County. Access to the NWIRP is from South Oyster Bay Road.

1.3 Geology and Hydrogeology

Overburden at the site consists of well over 1,000 feet (ft) of unconsolidated deposits overlying crystalline bedrock of the Hartland Formation. Overburden is divided into four geologic units: the upper Pleistocene deposits, the Magothy Formation, the clay member of the Raritan Formation ("Raritan Clay") and the Lloyd Sand member of the Raritan Formation ("Lloyd Sand") (Geraghty and Miller, 1994).

The upper Pleistocene ranges in thickness from approximately 50 to 100 ft and consists of till and outwash deposits of medium to coarse sand and gravel with lenses of fine sand, silt and clay (Smolensky and Feldman, 1990); these deposits form the Upper Glacial Aquifer. Directly underlying this unit is the Magothy Formation with a thickness of 650 to 900 ft and lower extent of 700 to 1000 ft below ground surface (bgs), as observed at the former NWIRP and extending southeast to areas south of Southern State Parkway. Locally at the RE123 locations, the bottom of the Magothy (top of the Raritan Clay) is encountered at approximately 878 feet bgs. The Magothy is characterized by fine to medium sands and silts interbedded with zones of clays, silty sands and sandy clays. Sand and gravel lenses are found in some areas between depths of 600 and 880 ft bgs; these deposits form the main producing zones of the Magothy Aquifer.

Investigations performed by the Navy since 2012 indicate that the bottom of the Magothy (top of the Raritan Clay) can extend to depths of 700 to greater than 1,000 ft bgs. The top of the Raritan Clay deepens to the south-southeast, as evidenced by clay depths of 1,000 ft bgs (or more) in borings installed offsite. The Raritan Clay Unit is of continental origin and consists of clay, silty clay, clayey silt, and fine silty sand. This member acts as a confining layer over the Lloyd Sand Unit. The Lloyd Sand Unit is also of continental origin, having been deposited in a large fresh water lacustrine

environment. The material consists of fine to coarse-grained sands, gravel, inter-bedded clay, and silty sand. These deposits form the Lloyd Aquifer.

The Upper Glacial Aquifer and the Magothy Aquifer comprise the aquifers of interest at the NWIRP. Regionally, these formations are generally considered to form a common, interconnected aquifer as the coarse nature of each unit near their contact and the lack of any regionally confining clay unit allows for the unrestricted flow of groundwater between the formations.

The Magothy Aquifer is the major source of public water in Nassau County. The most productive water bearing zones are the discontinuous lenses of sand and gravel that occur within the siltier matrix. The major water-bearing zones are coarse sand and gravel lenses located in the lower portion of the Magothy. The Magothy Aquifer is commonly regarded to function overall as an unconfined aquifer at shallow depths and a confined aquifer at deeper depths. The drilling program at the NWIRP has revealed that clay zones beneath the facility are common but laterally discontinuous. No confining clay units of facility-wide extent have been encountered. This is also the case for borings installed offsite.

Groundwater is encountered at a depth of approximately 50 ft bgs at the facility. Historically, because of pumping and recharge at the facility, groundwater depths have been measured to range from 40 to 60 ft bgs. The groundwater flow in the area is to the south-southeast.

2.0 FIELD PROGRAM

Three monitoring wells were installed in the vicinity of VPB157 between June and August 2015. Field investigation activities consisted of drilling, well installation, well development, sampling, soil/groundwater analysis, and surveying. Drilling during this investigation was performed by Delta Well and Pump Company of Ronkonkoma, New York. A description of these tasks is provided below.

2.1 Drilling and Well Construction

Monitoring wells RE123D1, RE123D2 and RE123D3 were installed using mud rotary drilling techniques (Figure 2). Depths of monitoring wells RE123D1, RE123D2 and RE123D3 were 505 ft, 660 ft and 840 ft respectively. Well construction details are summarized in Table 1. Boring logs with lithologic descriptions of the well screen interval are included in the Appendix A. *2015 OU2 Groundwater Investigation VPB157* (Resolution Consultants, 2016) documents the installation of this VPB including detailed lithologic descriptions, continuous gamma plot and multiple Volatile Organic Compounds (VOC) sample results over the entire boring length.

Prior to installing each monitoring well, the results of the groundwater samples, the geophysical logs, lithology and field data from the vertical profile borings were analyzed. Screen intervals were determined based on this analysis: intervals with the highest VOC concentrations as measured in the hydropunch samples, and coincident intervals with the highest apparent permeability based on the gamma logs. During the monitoring well installation, split spoon samples were collected every 5 ft in the screen interval. One soil sample per monitoring well was analyzed for Total Organic Carbon (TOC) via United States (US) Environmental Protection Agency (EPA) series SW-846 method 9060A by Katahdin Analytical Services (Katahdin). Data validation of TOC data was performed by Resolution Consultants. Data validation packages and analytical data tables are included in Appendix A.

Wells were constructed of 4-inch diameter, Schedule 80, National Sanitation Foundation-approved polyvinylchloride (PVC) riser pipe and .010-slot well screen. Wells were completed at the surface with a 12-inch diameter steel curb box. Well risers were set below grade and fit with lockable J plugs. Detailed monitoring well construction diagrams are included in Appendix A.

2.2 Well Development

Following installation, all monitoring wells were developed to evacuate silts and other fine-grained materials and to establish the filter pack to promote a hydraulic connection between the well and

the surrounding aquifer. Well development was not initiated until at least 24 hours after well installation.

Monitoring well screens were developed using a combination of air lifting, manual surging, and pumping with a submersible pump. Turbidity was monitored during development to determine stabilization. In compliance with New York State Department of Environmental Conservation (NYSDEC) policy, wells were developed until turbidity was less than 50 nephelometric turbidity units (NTUs) if possible. Table 2 summarizes total pumped volume from air and pump development and final turbidity. Well development logs are included in Appendix A.

2.3 Sampling

Following development, wells were allowed to stabilize for at least 2 weeks prior to groundwater sampling in accordance with low flow sampling procedures. Wells were purged using a bladder pump with a drop tube intake placed at the approximate midpoint of the screened interval. The following water quality parameters were continuously measured: water temperature, pH, conductivity, oxidation-reduction potential, dissolved oxygen and turbidity. Groundwater analytical samples were collected when water quality parameters stabilized. Samples were analyzed for VOCs via method 8260B and 1,4-dioxane via Method 8270C by Katahdin. All development and purge water was managed as investigation derived waste (IDW). Groundwater sample logs and data validation packages are included in Appendix A.

Monitoring wells RE123D1, RE123D2 and RE123D3 are sampled quarterly as part of the Navy's ongoing Environmental Restoration Program. Resolution Consultants sampled these three wells during the September 2015 quarterly monitoring event. Analytical results and stabilized field parameters for these data are summarized in Table 3 and 4, respectively. Data validation is documented in Appendix A.

2.4 Decontamination and Investigation Derived Waste (IDW)

Resolution Consultants utilized dedicated and disposable sampling equipment when possible to avoid the potential for cross-contamination of samples. The sampling equipment included dedicated plastic scoops, disposable Teflon or polyethylene tubing, disposable gloves, and laboratory supplied sample bottles. Hand held equipment and split spoons were decontaminated using Liquinox and water wash, a potable water rinse, followed by a distilled water rinse. Water was collected in 5-gallon pails or 55-gallon drums. Non dedicated sampling equipment was decontaminated as outlined in the UFP SAP Addendum - *Groundwater Sampling Using Low Stress (Low Flow) Purging and Sampling Protocol* (Resolution Consultants, 2013b).

As part of the IDW management practices and in accordance with the SAP, the investigation waste (consisting of soil cuttings, drilling muds, IDW fluids, and personal protective equipment [PPE]) generated during the groundwater monitoring well installation and sampling was containerized and staged at NWIRP Bethpage.

IDW solids were containerized in roll offs. Representative samples from each roll off were submitted to Katahdin for analysis of:

- Target Compound List (TCL) VOCs
- TCL Semi-volatile Organic Compounds (SVOCs)
- Toxicity Characteristic Leaching Procedure (TCLP) Metals
- Polychlorinated Biphenyls (PCBs)
- Total petroleum hydrocarbons
- Corrosivity
- Ignitability
- Reactive Cyanide
- Reactive Sulfide
- Paint Filter

IDW fluid generated during well development and purging was containerized in frac tanks and stored at NWIRP Bethpage for characterization and ultimate disposal to the Publicly Owned Treatment Works (POTW), in accordance with the facilities existing discharge permit. A representative water sample was collected from each frac tank and submitted to Katahdin for analysis of VOCs via Method SW 624, pH via Method SW 9040B, PCBs via Method 8082 and Total Metals via Method SW 846. All analytical criteria were met for disposal of water.

2.5 Surveying

A survey of the monitoring well locations was conducted at the end of fieldwork by C. T. Male, Inc., of Latham, NY, under the direct supervision of Resolution Consultants. The locations were tied into the existing base map developed for this investigation. The survey elevation is referenced to the North American Vertical Datum (NAVD) 1988 and has a vertical accuracy of 0.01 foot. Vertical control is based on observations of the Continuously Operating Reference (COR) Stations Queens and Central Islip. The horizontal location is referenced to the North American Datum (NAD) 1983 (2011) N.Y. Long Island Zone 3104 and has an accuracy of 0.1 foot. Local horizontal and vertical

control is based on Global Positioning System (GPS) observations using the NYSNet Real Time Network.

A table of survey data (latitude/longitude, northing/easting, elevations of ground, rim and PVC) and a survey map is included in Appendix A.

3.0 REFERENCES

Geraghty and Miller, Inc., 1994. *Remedial Investigation Report, Grumman Aerospace Corporation, Bethpage, New York*. Revised September 1994.

Naval Facilities Engineering Command (NAVFAC), 2003. *Record of Decision Naval Weapons Industrial Reserve Plant Bethpage, New York, Operable Unit 2 – Groundwater*, NYS Registry: 1-30-003B. April 2003.

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Tables

TABLE 1
MONITORING WELL CONSTRUCTION SUMMARY
2015 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

MONITORING WELL	WELL COMPLETION DATE	GROUND ELEVATION (MSL)	PVC ELEVATION (INNER CASING) (MSL)	WELL DEPTH (ft bgs)	CASING DEPTH (ft bgs)	SCREEN INTERVAL (ft bgs)	SUMP DEPTH INTERVAL (ft bgs)	BORING DEPTH (ft bgs)
RE123D1	7/9/2015	105.93	105.49	505	52.5	480 - 500	500 - 505	520
RE123D2	8/3/2015	106.32	106.11	660	54	635 - 655	655 - 660	675
RE123D3	8/28/2015	106.15	105.92	840	53.5	815 - 835	835 - 840	855

MSL - mean sea level

ft bgs - feet below ground surface

TABLE 2
MONITORING WELL DEVELOPMENT SUMMARY
2015 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

MONITORING WELL	AIR DEVELOPMENT		PUMP DEVELOPMENT			APPROX. TOTAL DEVELOPMENT VOLUME (GAL)	FINAL TURBIDITY (NTUs)
	DATE	APPROX. VOLUME (GAL)	DATE	FINAL PUMP DEPTH (FT BGS)	APPROX. VOLUME (GAL)		
RE123D1	9/3/2015	5000	9/8/2015	480-500	6000	11,000	4.19
RE123D2	9/4/2015	5000	9/9/2015-9/10/2015	635-655	5925	10,925	5.36
RE123D3	9/2/2015	6500	9/10/2015-9/11/2015	815-835	6240	12,740	5.14

GAL - gallon
FT BGS - feet below ground surface
NTUs - Nephelometric Turbidity Units

TABLE 3
ANALYTICAL DATA SUMMARY
2015 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Location	NYSDEC Groundwater Guidance or Standard Value (Note 1)	RE123D1	RE123D2	RE123D3
Sample Date		9/29/2015	9/29/2015	9/29/2015
Sample ID		RE123D1-GW-092915	RE123D2-GW-092915	RE123D3-GW-092915
Sample type code		N	N	N
VOC 8260C (ug/L)				
1,1,1-TRICHLOROETHANE	5	< 0.50 U	< 0.50 U	< 0.50 U
1,1,2,2-TETRACHLOROETHANE	5	< 0.50 U	< 0.50 U	< 0.50 U
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	5	< 0.50 U	< 0.50 U	< 0.50 U
1,1,2-TRICHLOROETHANE	1	< 0.50 U	< 0.50 U	< 0.50 U
1,1-DICHLOROETHANE	5	< 0.50 U	< 0.50 U	< 0.50 U
1,1-DICHLOROETHENE	5	**0.42 J**	< 0.50 U	< 0.50 U
1,2,4-TRICHLOROBENZENE	5	< 0.50 U	< 0.50 U	< 0.50 U
1,2-DIBROMO-3-CHLOROPROPANE	0.04	***< 0.75 U***	***< 0.75 U***	***< 0.75 U***
1,2-DIBROMOETHANE	NL	< 0.50 U	< 0.50 U	< 0.50 U
1,2-DICHLOROBENZENE	3	< 0.50 U	< 0.50 U	< 0.50 U
1,2-DICHLOROETHANE	5	< 0.50 U	< 0.50 U	< 0.50 U
1,2-DICHLOROETHENE, TOTAL	5	**0.50 J**	< 1.0 U	< 1.0 U
1,2-DICHLOROPROPANE	1	< 0.50 U	< 0.50 U	< 0.50 U
1,3-DICHLOROBENZENE	3	< 0.50 U	< 0.50 U	< 0.50 U
1,4-DICHLOROBENZENE	3	< 0.50 U	< 0.50 U	< 0.50 U
1,4-DIOXANE (Method 8270D_SIM)	NL	**6.6**	**0.93**	< 0.17 U
2-BUTANONE	50	< 2.5 UJ	< 2.5 UJ	< 2.5 UJ
2-HEXANONE	50	< 2.5 UJ	< 2.5 UJ	< 2.5 UJ
4-METHYL-2-PENTANONE	NL	< 2.5 UJ	< 2.5 UJ	< 2.5 UJ
ACETONE	50	**5.4 J**	< 2.5 UJ	< 2.5 UJ
BENZENE	1	< 0.50 U	< 0.50 U	< 0.50 U
BROMODICHLOROMETHANE	50	< 0.50 U	< 0.50 U	< 0.50 U
BROMOFORM	50	< 0.50 U	< 0.50 U	< 0.50 U
BROMOMETHANE	5	< 1.0 U	< 1.0 U	< 1.0 U
CARBON DISULFIDE	60	< 0.50 UJ	< 0.50 UJ	< 0.50 UJ
CARBON TETRACHLORIDE	5	< 0.50 U	< 0.50 U	< 0.50 U
CHLOROBENZENE	5	< 0.50 U	< 0.50 U	< 0.50 U
CHLOROETHANE	5	< 1.0 U	< 1.0 U	< 1.0 U
CHLOROFORM	7	< 0.50 U	< 0.50 U	< 0.50 U
CHLOROMETHANE	5	< 1.0 U	< 1.0 UJ	< 1.0 UJ
CIS-1,2-DICHLOROETHENE	5	**0.50 J**	< 0.50 U	< 0.50 U
CIS-1,3-DICHLOROPROPENE	0.4	***< 0.50 U***	***< 0.50 U***	***< 0.50 U***
CYCLOHEXANE	NL	< 0.50 U	< 0.50 U	< 0.50 U
DIBROMOCHLOROMETHANE	5	< 0.50 U	< 0.50 U	< 0.50 U
DICHLORODIFLUOROMETHANE	5	< 1.0 U	< 1.0 U	< 1.0 U
ETHYLBENZENE	5	< 0.50 U	< 0.50 U	< 0.50 U
ISOPROPYLBENZENE	5	< 0.50 U	< 0.50 U	< 0.50 U
M- AND P-XYLENE	NL	< 1.0 U	< 1.0 U	< 1.0 U
METHYL ACETATE	NL	< 0.75 U	< 0.75 U	< 0.75 U
METHYL CYCLOHEXANE	NL	< 0.50 U	< 0.50 U	< 0.50 U
METHYL TERT-BUTYL ETHER	10	< 0.50 U	< 0.50 U	< 0.50 U
METHYLENE CHLORIDE	5	< 2.5 U	< 2.5 U	< 2.5 U
O-XYLENE	NL	< 0.50 UJ	< 0.50 UJ	< 0.50 UJ
STYRENE	5	< 0.50 U	< 0.50 U	< 0.50 U
TETRACHLOROETHENE	5	**3.8 J**	**3.7 J**	< 0.50 UJ
TOLUENE	5	< 0.50 U	< 0.50 U	< 0.50 U
TRANS-1,2-DICHLOROETHENE	5	< 0.50 U	< 0.50 U	< 0.50 U
TRANS-1,3-DICHLOROPROPENE	0.4	***< 0.50 U***	***< 0.50 U***	***< 0.50 U***
TRICHLOROETHENE	5	**12**	**1.4**	< 0.50 U
TRICHLOROFLUOROMETHANE	5	< 1.0 U	< 1.0 U	< 1.0 U
VINYL CHLORIDE	2	< 1.0 U	< 1.0 U	< 1.0 U
XYLENES, TOTAL	5	< 1.5 U	< 1.5 U	< 1.5 U

TABLE 3
ANALYTICAL DATA SUMMARY
2015 OU2 GROUNDWATER INVESTIGATION
NWIRT BETHPAGE, NY

Notes:

1 New York State Department of Environmental Conservation Division of Water Technical and Operation Guidance series (6 NYCRR 700-706, Part 703.5 summarized in TOGS 1.1.1)
Ambient water quality standards and groundwater effluent limitations, class GA; NL = Not Listed

Bold = Detected; ***Bold and Italics*** =Not detected exceeds NYS Groundwater Standards or guidance value

Yellow highlighted values exceed Groundwater Standards or guidance value

Sample type codes: N - normal environmental sample, FD - field duplicate

U = Nondetected result. The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte.

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

M = the matrix spike or matrix spike duplicate did not meet recovery or precision requirements.

TABLE 4
STABILIZED FIELD PARAMETERS
2015 OU2 GROUNDWATER INVESTIGATION
NWIRP BETHPAGE, NY

Well	Date	Temperature (°C)	pH	Specific Conductance (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Depth to water (ft bgs)	Flow rate (ml/min)
RE123D1	9/29/2015	19.82	5.01	0.097	7.64	261.9	5.26	46.62	500
RE123D2	9/29/2015	21.41	4.34	0.025	6.52	324.1	13.2	49.02	500
RE123D3	9/29/2015	19.54	5.12	0.041	0.46	-119.0	9.87	49.31	500

°C - degrees Celsius
µS/cm - Microsiemens per Centimeter
mg/L - milligrams per liter
mV - Millivolts
NTU - Nephelometric Turbidity Unit
ft bgs - feet below ground surface
ml/min - milliliters per minute

Figures

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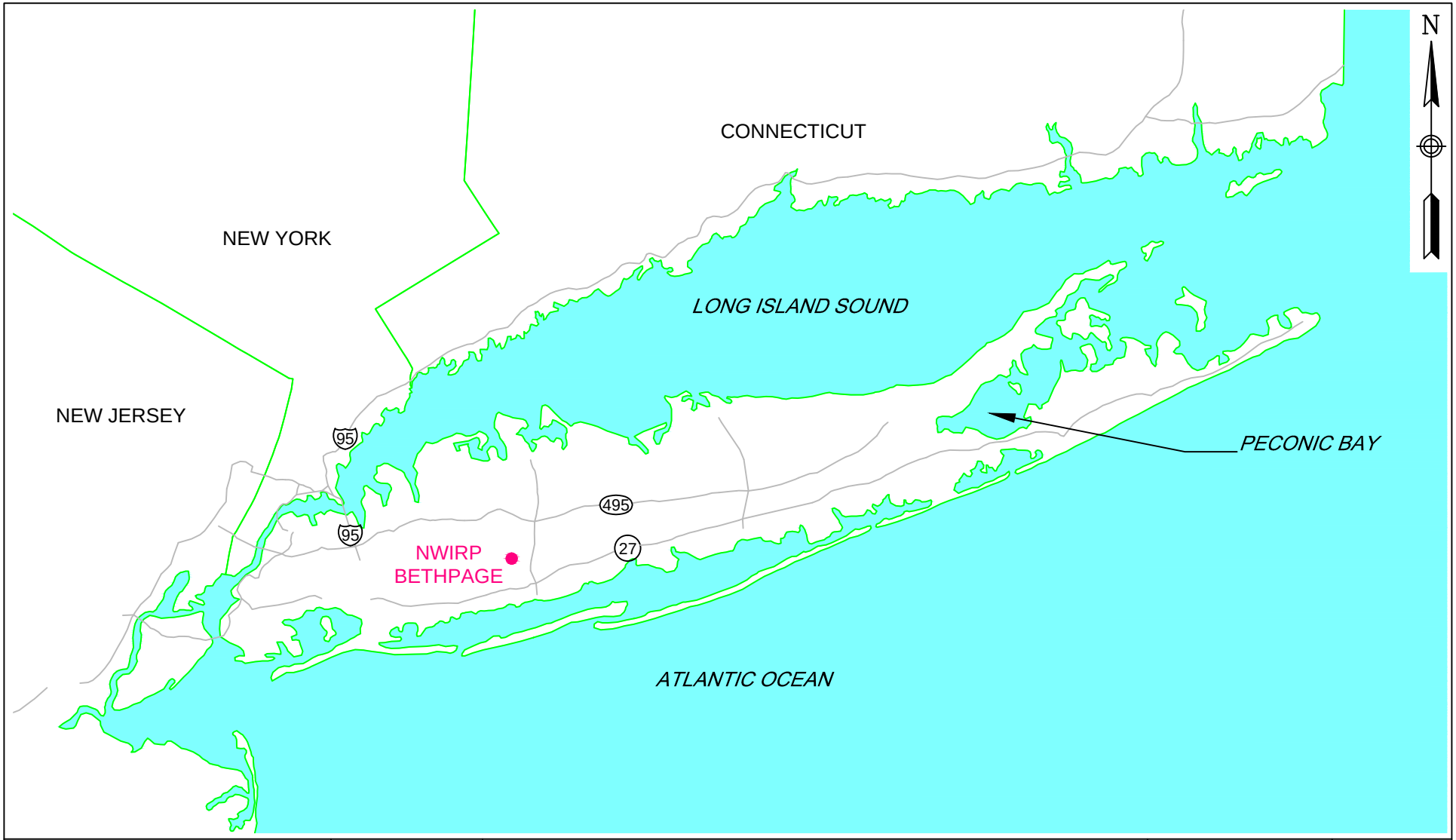

0 15 30

SCALE IN MILES

NAVFAC

GENERAL LOCATION MAP
NWIRP BETHPAGE
BETHPAGE, NEW YORK

CONTRACT NUMBER	CTO NUMBER
N62470-11-D-8013	WE15
APPROVED BY --	DATE --
APPROVED BY --	DATE --
FIGURE NO. 1	REV 0

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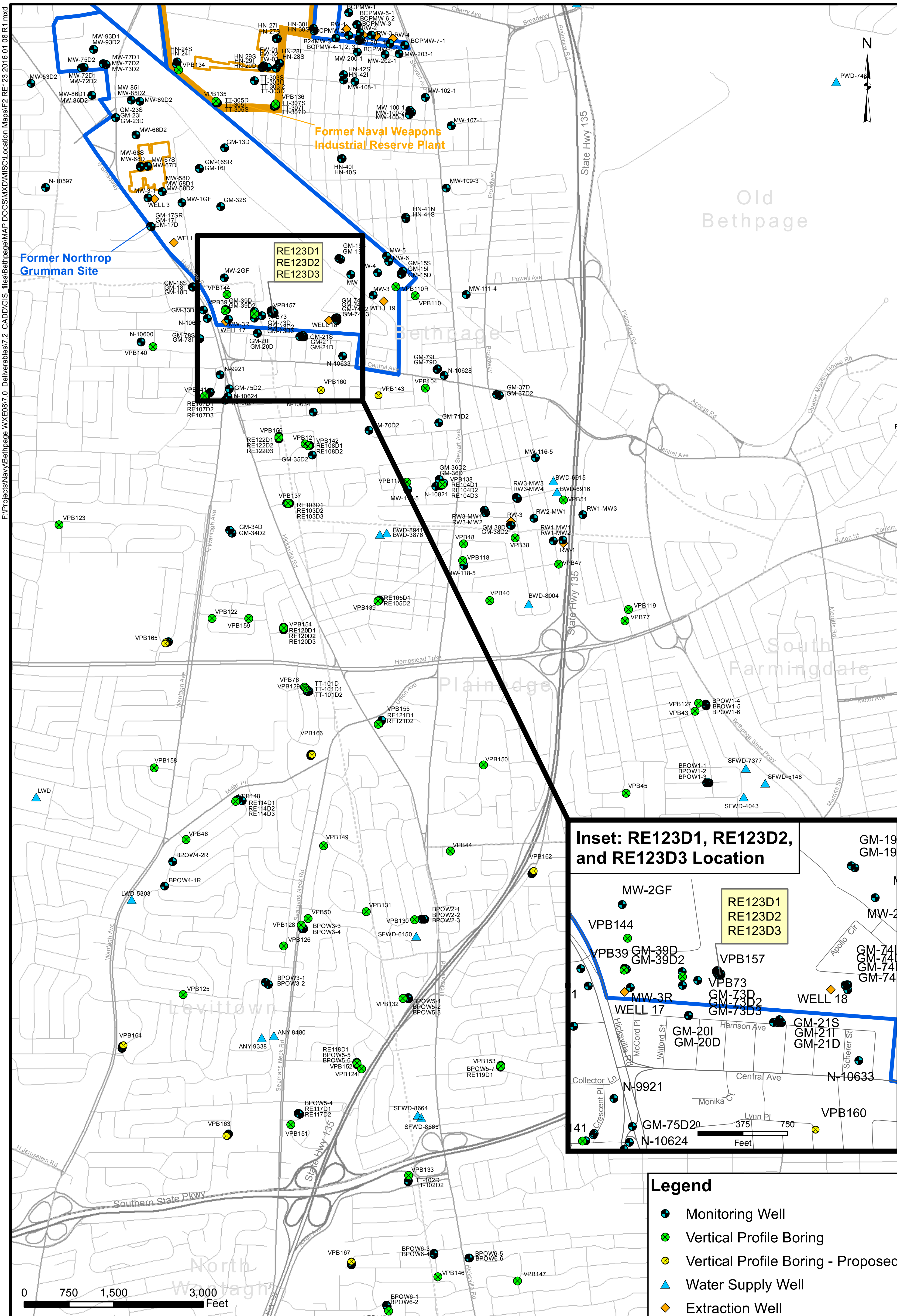
Former Naval Weapons Industrial Reserve Plant
Former Northrop Grumman Site
Old Bethpage
Bethpage
South Farmingdale
Plainedge
Levittown
North Wantagh
State Hwy 135
Southern State Pkwy
Hempstead Tpke
Central Ave
Hicksville Rd
Broadway
Stewart Ave
Plainview Rd
Wantagh Ave
N Wantagh Ave
Seamans Neck Rd
Bethpage State Pkwy
Merritts Rd
Quaker Meeting House Rd
Access Rd
Powell Ave
Cherry Ave
S Broadway
Miller Pl
Union Ave
N Jerusalem Rd
Fulton St
Conklin St
Motor Ave
Aiken Ave
N
RE123D1
RE123D2
RE123D3
MW-93D1
MW-93D2
MW-75D2
MW-77D1
MW-77D2
MW-73D2
MW-53D2
MW-72D1
MW-72D2
MW-86D1
MW-86D2
MW-85I
MW-85D2
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BCPMW-6-2
BCPMW-3
RW-1
RW-2
RW-3
RW-4
B24MW-3
BCPMW-4-1, 2, 3
BCPMW-7-1
MW-203-1
MW-200-1
MW-202-1
HN-42S
HN-42I
MW-108-1
MW-102-1
MW-100-1
MW-100-2
MW-100-3
MW-107-1
HN-40I
HN-40S
MW-109-3
HN-41N
HN-41S
MW-5
MW-6
GM-15S
GM-15I
GM-15D
MW-3
VPB110R
VPB110
WELL 19
MW-111-4
MW-2GF
VPB144
VPB39
GM-39D
GM-39D2
VPB157
VPB73
GM-73D
GM-73D2
GM-73D3
MW-3R
WELL 17
WELL 18
GM-18S
GM-18I
GM-18D
GM-33D
N-10600
VPB140
GM-78S
GM-78I
GM-20I
GM-20D
GM-21S
GM-21I
GM-21D
N-10633
N-9921
GM-75D2
N-10624
VPB160
VPB143
VPB104
GM-79I
GM-79D
N-10628
GM-37D
GM-37D2
RE107D1
RE107D2
RE107D3
N-10634
GM-70D2
GM-71D2
VPB156
RE122D1
RE122D2
RE122D3
VPB121
VPB142
RE108D1
RE108D2
GM-35D2
MW-116-5
GM-36D2
GM-36D
VPB138
RE104D1
RE104D2
RE104D3
N-10821
VPB117
BWD-6915
BWD-6916
VPB51
RW3-MW3
RW3-MW4
RW3-MW1
RW3-MW2
RW2-MW1
RW1-MW3
GM-38D
GM-38D2
RW1-MW1
RW1-MW2
VPB48
VPB38
VPB47
VPB118
MW-118-5
VPB137
RE103D1
RE103D2
RE103D3
VPB123
GM-34D
GM-34D2
BWD-8941
BWD-3876
VPB40
BWD-8004
RE105D1
RE105D2
VPB139
VPB119
VPB77
VPB122
VPB159
VPB154
RE120D1
RE120D2
RE120D3
VPB165
VPB76
VPB129
TT-101D
TT-101D1
TT-101D2
VPB155
RE121D1
RE121D2
VPB127
VPB43
BPOW1-4
BPOW1-5
BPOW1-6
VPB166
VPB150
VPB158
LWD
BPOW1-1
BPOW1-2
BPOW1-3
SFWD-7377
SFWD-5148
SFWD-4043
VPB45
VPB148
RE114D1
RE114D2
RE114D3
VPB46
BPOW4-2R
BPOW4-1R
LWD-5303
VPB149
VPB44
VPB162
VPB50
VPB128
BPOW3-3
BPOW3-4
VPB126
VPB131
VPB130
BPOW2-1
BPOW2-2
BPOW2-3
SFWD-6150
BPOW3-1
BPOW3-2
VPB125
VPB132
BPOW5-1
BPOW5-2
BPOW5-3
ANY-8480
ANY-9338
VPB164
RE118D1
BPOW5-5
BPOW5-6
VPB152
VPB124
VPB153
BPOW5-7
RE119D1
BPOW5-4
RE117D1
RE117D2
VPB151
VPB163
SFWD-8664
SFWD-8665
VPB133
TT-102D
TT-102D2
VPB167
BPOW6-3
BPOW6-4
BPOW6-5
BPOW6-6
VPB146
VPB147
BPOW6-1
BPOW6-2
VPB145
PWD-743
0
750
1,500
3,000
Feet
Inset: RE123D1, RE123D2, and RE123D3 Location
Harrison Ave
Collector Ln
Crescent Pl
McCord Pl
Wilford St
Scherer St
Monika Ct
Lynn Pl
Apollo Cir
0
375
750
Feet
Legend
Monitoring Well
Vertical Profile Boring
Vertical Profile Boring - Proposed
Water Supply Well
Extraction Well

NAVFAC

RE123D1, RE123D2, AND RE123D3 LOCATION MAP
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

CONTRACT NUMBER	CTO NUMBER
N62470-11-D8013	WE15
APPROVED BY PS	DATE 1/8/2016
APPROVED BY —	DATE —
FIGURE NO. 2	REV 0

Appendix A

RE123D1, RE123D2, RE123D3

Section 1

Boring Logs

Resolution Consultants

Boring Log

BORING #: RE123D1
Sheet 1 of 2

Client: Department of the Navy, Naval Facilities Engineering Command, Mid-Atlantic		**Logged By:** V. Thayer
Location: Sunbeam Ave., Bethpage, NY		**Drilling Company:** Delta Well & Pump
Project #: 60266526	**Ground Elevation (msl):** 105.93	**Well Screen Interval (ft):** 480-500
Start Date: 6/25/2015	**Drilling Method:** Auger (0-50' bgs) Mud Rotary (>50' bgs)	**Water Level (ft):**
Finish Date: 7/9/2015	**Northing:** 209894.44 **Easting:** 1124871.2	**Total Depth (ft):** 520.0

DEPTH (ft)	PID (ppm)	Formation	USCS	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion	Well Construction
0 50 100 150 200 250 300 350 400 450					0-483 ft bgs: See VPB157 for Descriptions		10" Diameter Steel Casing Bentonite Grout 4" Diameter Schedule 80 PVC Riser

Resolution Consultants

Boring Log

BORING #: RE123D1
Sheet 2 of 2

Client: Department of the Navy, Naval Facilities Engineering Command, Mid-Atlantic		**Logged By:** V. Thayer
Location: Sunbeam Ave., Bethpage, NY		**Drilling Company:** Delta Well & Pump
Project #: 60266526	**Ground Elevation (msl):** 105.93	**Well Screen Interval (ft):** 480-500
Start Date: 6/25/2015	**Drilling Method:** Auger (0-50' bgs) Mud Rotary (>50' bgs)	**Water Level (ft):**
Finish Date: 7/9/2015	**Northing:** 209894.44 **Easting:** 1124871.2	**Total Depth (ft):** 520.0

DEPTH (ft)	PID (ppm)	Formation	USCS	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion	Well Construction
468					0-483 ft bgs: See VPB157 for Descriptions *(continued)*		4" Diameter Schedule 80 PVC Riser *(continued)*
470							
472							
474							
476							#00 Filter Sand
478							
480							#1 Filter Sand
482							
484	0		SM		Layers of white (7.5 YR 8/1) and very pale brown (10 YR 8/2) SILTY SAND; angular medium Sand, little fine sand, 20% fines (silt or clay)		
486							
488	0		SP		Very pale brown (10 YR 8/2) poorly graded SAND, angular medium Sand, little fine sand		
490							4" Diameter schedule 80 PVC, 10 Slot Well Screen (480-500 ft bgs)
492							
494	1.0		SM		Light gray (10 YR 7/2) SILTY SAND interbedded with thickly laminated Lignite and one layer (1.5 in. thick) of poorly graded sand, medium sand		
496							
498	0		SP		Very pale brown (10 YR 7/3) poorly graded SAND, angular medium Sand, few coarse sand, trace silt		
500							
502							Sump
504							
506							
508							
510							
512							#1 Sand to fill bottom of boring to sump
514							
516							
518							
520					End of boring at 520.0 ft. bgs.		

Resolution Consultants

Boring Log

BORING #: RE123D2
Sheet 1 of 2

Client: Department of the Navy, Naval Facilities Engineering Command, Mid-Atlantic		**Logged By:** V. Thayer
Location: Sunbeam Ave., Bethpage, NY		**Drilling Company:** Delta Well & Pump
Project #: 60266526	**Ground Elevation (msl):** 106.32	**Well Screen Interval (ft):** 635-655
Start Date: 7/22/2015	**Drilling Method:** Auger (0-50' bgs) Mud Rotary (>50' bgs)	**Water Level (ft):**
Finish Date: 8/3/2015	**Northing:** 209887.34 **Easting:** 1124886.22	**Total Depth (ft):** 675.0

Note: auger drilling to install casing 7/13/15-7/14/15; mud rotary to install well 7/22/15-8/3/15.

DEPTH (ft)	PID (ppm)	Formation	USCS	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion	Well Construction
0					0-638 ft bgs: See VPB157 for Descriptions		10" Diameter Steel Casing
50							8" Diameter Steel Inner Casing
100							
150							
200							
250							Bentonite Grout
300							
350							
400							
450							
500							4" Diameter Schedule 80 PVC Riser
550							
600							

Resolution Consultants

Boring Log

BORING #: RE123D2
Sheet 2 of 2

Client: Department of the Navy, Naval Facilities Engineering Command, Mid-Atlantic		**Logged By:** V. Thayer
Location: Sunbeam Ave., Bethpage, NY		**Drilling Company:** Delta Well & Pump
Project #: 60266526	**Ground Elevation (msl):** 106.32	**Well Screen Interval (ft):** 635-655
Start Date: 7/22/2015	**Drilling Method:** Auger (0-50' bgs) Mud Rotary (>50' bgs)	**Water Level (ft):**
Finish Date: 8/3/2015	**Northing:** 209887.34 **Easting:** 1124886.22	**Total Depth (ft):** 675.0

DEPTH (ft)	PID (ppm)	Formation	USCS	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion	Well Construction
608					0-638 ft bgs: See VPB157 for Descriptions *(continued)*		4" Diameter Schedule 80 PVC Riser *(continued)*
610							
612							
614							
616							
618							
620							#00 Filter Sand
622							
624							
626							
628							
630							#1 Filter Sand
632							
634							
636							
638	0		SW-SM		Light gray (10 YR 7/2) well graded SAND with Silt and gravel; subangular medium to coarse sand, few fine sand, few silt, fine gravel (30%)		
640							
642							
644	0		SW		Very pale brown (10 YR 7/3) well graded SAND with Gravel, subangular medium to coarse sand, little fine sand, subrounded fine to coarse gravel (25%)		4" Diameter schedule 80 PVC, 10 Slot Well Screen (635-655 ft bgs)
646							
648							
650	0		SW		Very pale brown (10 YR 7/3) SAND with Gravel, angular medium to coarse sand, subrounded to subangular fine to coarse gravel (30%)		
652							
654			GW		White to very pale brown (10 YR 8/1, 8/2) well graded GRAVEL, subrounded to subangular fine to coarse Gravel		
656	0		SW-SC		Very pale brown (10 YR 7/3) well graded SAND with Clay and gravel, slight orange staining, angular sand		Sump
658							
660							
662							
664							
666							
668							#1 Sand to fill bottom of boring to sump
670							
672							
674							
					End of boring at 675.0 ft. bgs.		

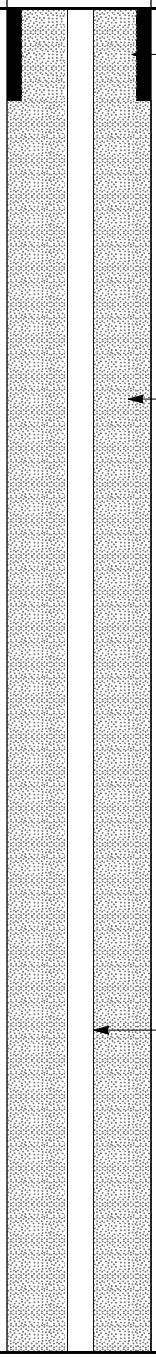
Resolution Consultants

Boring Log

BORING #: RE123D3
Sheet 1 of 2

Client: Department of the Navy, Naval Facilities Engineering Command, Mid-Atlantic		**Logged By:** V. Thayer
Location: Sunbeam Ave., Bethpage, NY		**Drilling Company:** Delta Well & Pump
Project #: 60266526	**Ground Elevation (msl):** 106.15	**Well Screen Interval (ft):** 815-835
Start Date: 8/12/2015	**Drilling Method:** Auger (0-50' bgs) Mud Rotary (>50' bgs)	**Water Level (ft):**
Finish Date: 8/28/2015	**Northing:** 209912.23 **Easting:** 124860.24	**Total Depth (ft):** 855.0

Note: auger drilling to install casing 7/15/15-7/17/15;
mud rotary to install well 8/12/15-8/28/15.

DEPTH (ft)	PID (ppm)	Formation	USCS	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion	Well Construction
0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 750					0-818 ft bgs: See VPB157 for Descriptions		10" Diameter Steel Casing Bentonite Grout 4" Diameter Schedule 80 PVC Riser

Resolution Consultants

Boring Log

BORING #: RE123D3
Sheet 2 of 2

Client: Department of the Navy, Naval Facilities Engineering Command, Mid-Atlantic		**Logged By:** V. Thayer
Location: Sunbeam Ave., Bethpage, NY		**Drilling Company:** Delta Well & Pump
Project #: 60266526	**Ground Elevation (msl):** 106.15	**Well Screen Interval (ft):** 815-835
Start Date: 8/12/2015	**Drilling Method:** Auger (0-50' bgs) Mud Rotary (>50' bgs)	**Water Level (ft):**
Finish Date: 8/28/2015	**Northing:** 209912.23 **Easting:** 124860.24	**Total Depth (ft):** 855.0

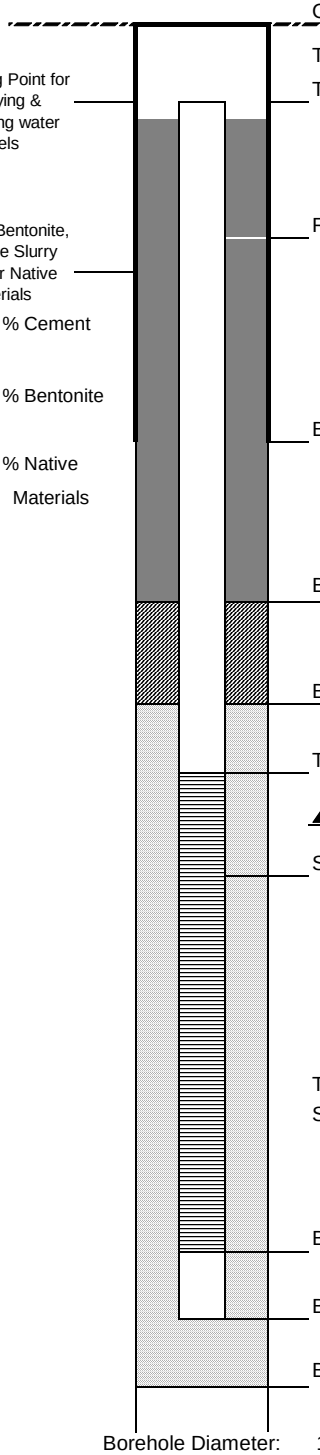
DEPTH (ft)	PID (ppm)	Formation	USCS	GRAPHIC LOG	MATERIAL DESCRIPTION	Well Completion	Well Construction
780					0-818 ft bgs: See VPB157 for Descriptions *(continued)*		4" Diameter Schedule 80 PVC Riser *(continued)*
782							
784							
786							
788							
790							
792							
794							
796							#00 Filter Sand
798							
800							
802							
804							
806							
808							
810							#1 Filter Sand
812							
814							
816							
818	0		SP-SM		Gray (10 YR 6/1) poorly graded SAND with Silt, angular medium sand, little fine sand, few coarse sand, few fines (clay or silt)		
820							
822							
824	0		SP-SM		Gray (10 YR 6/1) poorly graded SAND with Silt, angular medium sand, little fine sand, few fines (clay or silt)		4" Diameter schedule 80 PVC, 10 Slot Well Screen (815-835 ft bgs)
826							
828							
830	0		SC		Gray (10 RY 5/1) clayey SAND, angular fine to coarse Sand, trace fine gravel, 20% fines (clay or silt) grades with depth to medium sand, few coarse sand, fines (20%)		
832							
834	0		SP-SM		Light gray (GLEY 1 7/1) poorly graded SAND with Silt, angular medium sand, little fine sand, 10% fines (silt or clay), muscovite flakes		
836							
838							Sump
840							
842							
844							
846							
848							#1 Sand to fill bottom of boring to sump
850							
852							
854							
					End of boring at 855.0 ft. bgs.		

Section 2

Monitoring Well Construction Logs

RESOLUTION CONSULTANTS	Client: NAVFAC	Project Number: 60266526	***WELL ID: RE123D1***
	Site Location: NWIRP BETHPAGE, NY		
	Well Location: Sunbeam Avenue, Bethpage, NY		Date Installed: 6/25/2015 - 7/9/2015
	Method: MUD ROTARY		Inspector: V. Thayer
	Coords: Northing: 209894.44 Easting: 1124871.20		Contractor: DELTA WELL & PUMP

MONITORING WELL CONSTRUCTION DETAIL



	Depth from G.S. (feet)	Elevation(feet) Datum
Ground Surface (G.S.)	0.00	105.93
Top of 12 inch diameter Steel Curb Box		
Top of Riser Pipe fit with locking j-plug	0.44	105.49
Riser Pipe:		
Length: 480		
Inside Diameter (ID): 4 inch		
Type of Material: PVC		
Bottom of 10 inch diameter Steel Surface Casing	52.5	53.4
Bottom of Bentonite Grout	471	-365.1
Bottom of #00 Filter Sand/Top of #1 Filter Sand	481	-375.1
Top of Screen	480	-374.1
▲ Stabilized Water Level		
Screen:		
Length: 20 ft		
Inside Diameter (ID): 4 inch		
Slot Size: 10		
Type of Material: PVC		
Type/Size of Sand: #1		
Sand Pack Thickness: 39 ft		
Bottom of Screen	500	-394.1
Bottom of Sump:	505	-399.1
Bottom of Borehole	520	-414.1

Borehole Diameter: 10 inch

Approved:

Signature

Date

Describe Measuring Point:

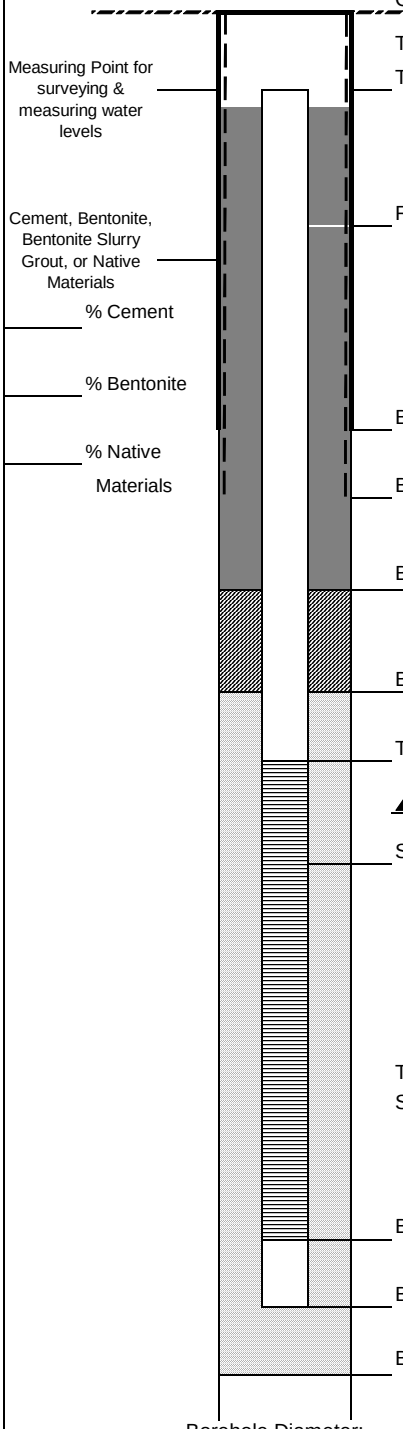
Ground Surface

RESOLUTION CONSULTANTS

Client: NAVFAC	Project Number: 60266526	***WELL ID: RE123D2***	
Site Location: NWIRP BETHPAGE, NY			
Well Location: Sunbeam Avenue, Bethpage, NY		Date Installed:	7/22/2015 - 8/3/15
Method: MUD ROTARY		Inspector:	V. Thayer
Coords: Northing: 209887.34	Easting: 1124886.22	Contractor:	DELTA WELL & PUMP

MONITORING WELL CONSTRUCTION DETAIL

NOTE: auger drilling to install casing 7/13/15 – 7/14/15; mud rotary to install well 7/22/15 – 8/3/15.



	Depth from G.S. (feet)	Elevation(feet) Datum
Ground Surface (G.S.)	0.00	106.32
Top of 12 inch diameter Steel Curb Box		
Top of Riser Pipe fit with locking j-plug	0.21	106.11
Riser Pipe:		
Length: 635		
Inside Diameter (ID): 4 inch		
Type of Material: PVC		
Bottom of 10 inch diameter Steel Surface Casing	54	52.3
Bottom of 8 inch diameter (inner) Steel Surface Casing	89	17.3
Bottom of Bentonite Grout	613	-506.7
Bottom of #00 Filter Sand/Top of #1 Filter Sand	625	-518.7
Top of Screen	635	-528.7
▲ Stabilized Water Level		
Screen:		
Length: 20 ft		
Inside Diameter (ID): 4 inch		
Slot Size: 10		
Type of Material: PVC		
Type/Size of Sand: #1		
Sand Pack Thickness: 50 ft		
Bottom of Screen	655	-548.7
Bottom of Sump:	660	-553.7
Bottom of Borehole	675	-568.7

Borehole Diameter: 8 inch

Approved:

Describe Measuring Point:

Ground Surface

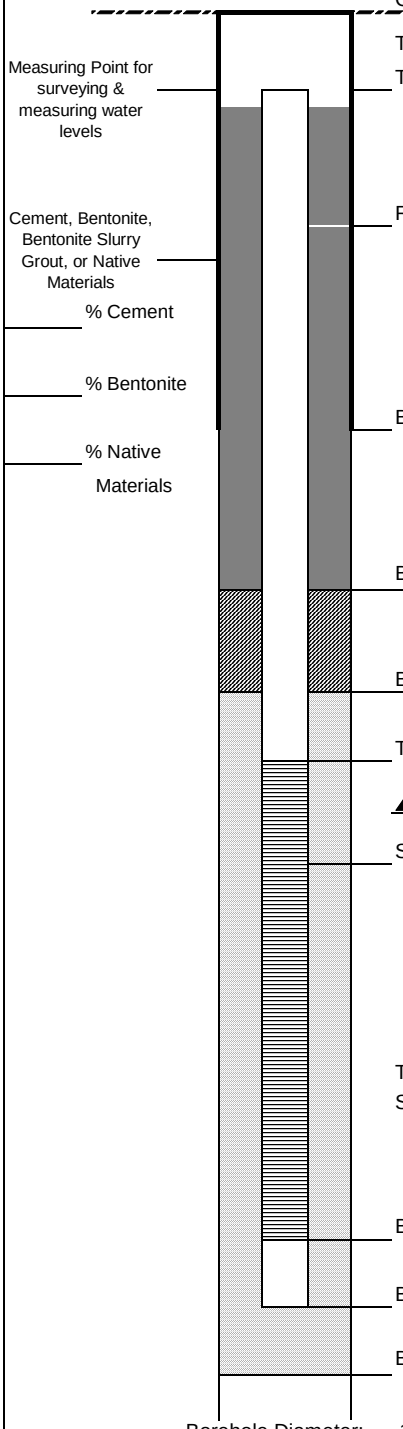
Signature

Date

RESOLUTION CONSULTANTS	Client: NAVFAC	Project Number: 60266526	***WELL ID: RE123D3***	
	Site Location: NWIRP BETHPAGE, NY			
	Well Location: Sunbeam Avenue, Bethpage, NY		Date Installed:	8/12/2015 - 8/28/2015
	Method: MUD ROTARY		Inspector:	V. Thayer
	Coords: Northing: 209912.23	Easting: 1124860.24	Contractor:	DELTA WELL & PUMP

MONITORING WELL CONSTRUCTION DETAIL

NOTE: auger drilling to install casing 7/15/15 – 7/17/15; mud rotary to install well 8/12/15 – 8/28/15.



	Depth from G.S. (feet)	Elevation(feet) Datum
Ground Surface (G.S.)	0.00	106.15
Top of 12 inch diameter Steel Curb Box		
Top of Riser Pipe fit with locking j-plug	0.23	105.92
Riser Pipe:		
Length: 815		
Inside Diameter (ID): 4 inch		
Type of Material: PVC		
Bottom of 10 inch diameter Steel Surface Casing	53.5	52.7
Bottom of Bentonite Grout	786.0	-679.9
Bottom of #00 Filter Sand/Top of #1 Filter Sand	805	-698.9
Top of Screen	815	-708.9
▲ Stabilized Water Level		
Screen:		
Length: 20 ft		
Inside Diameter (ID): 4 inch		
Slot Size: 10		
Type of Material: PVC		
Type/Size of Sand: #1		
Sand Pack Thickness: 50 ft		
Bottom of Screen	835	-728.9
Bottom of Sump:	840	-733.9
Bottom of Borehole	855	-748.9

Borehole Diameter: 10 inch

Approved:

Describe Measuring Point:

Ground Surface

Signature

Date

Section 3

Groundwater Sample Log Sheets

RESOLUTION CONSULTANTS

Well ID: RE123 D1

Low Flow Ground Water Sample Collection Record

955

Client: Navy NWIRP Bethpage Date: 9/29/15 Time: Start ~~840~~ am/pm
Project No: 60266526 Finish 1210 am/pm
Site Location: MW Lot
Weather Conds: foggy 70° Collector(s): Paul Kureth

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 54.5 c. Length of Water Column _____ (a-b)

Casing Diameter/Material: 4-inch PVC

b. Water Table Depth 45.43 d. Calculated System Volume (see back) 13.1 gal

2. WELL PURGE DATA

a. Purge Method: Geotech bladder pump with drop tube assembly

b. Acceptance Criteria defined (see workplan)

- Temperature	± 3%	- D.O.	± 10% (values >0.5 mg/L)	Turbidity	± 10%
- pH	± 0.1 unit	- ORP	± 10mV		
- Sp. Cond.	± 3%	- Drawdown	< 0.3'	Remove a minimum 1 screen volume	

c. Field Testing Equipment used:

	Make	Model	Serial Number
	YSI	556 mps	22120
	Hanna	HI 98703	U64518X

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Depth to water (ft)	Color/Odor
830										OH
955									46.62	RESET
1005		20.13	5.97	0.110	10.72	223.8	32.2	500	46.62	
1010		19.91	5.97	0.101	8.67	233.7	—	500	46.62	very cloudy
1015		19.88	5.90	0.097	7.38	233.5	1.78	500	46.62	cloudy
1020		19.82	5.89	0.096	7.74	242.0	—	500	46.62	"
1025		20.00	5.91	0.096	7.79	251.9	58.6	500	46.62	"

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☒	☐	☒
Has required turbidity been reached	☒	☐	☐
Have parameters stabilized	☒	☐	☐

If no or N/A - Explain below.

(continued on back)

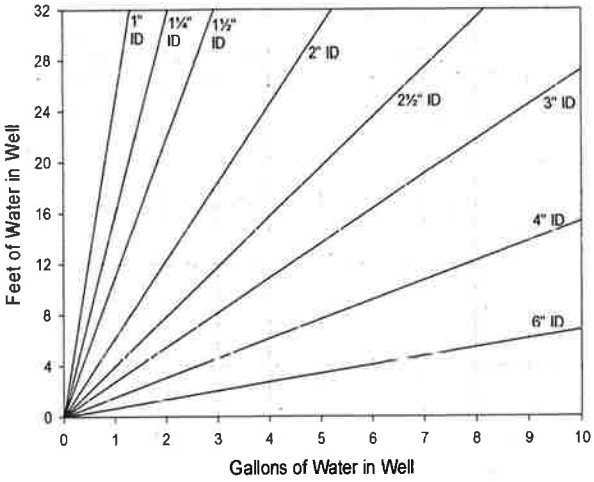
3. SAMPLE COLLECTION: Method: Geotech bladder pump with drop tube assembly

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
RE123D1-GW-092915	40-mL vial	3	HCl	VOCs	1140
RE123D1-GW-092915	1-L amber	2	none	1,4-Dioxane	1140

Comments Drop tube in Sump, reset pump @ 955
Equipment

Signature _____ Date _____

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

1 screen volume

15 ft = 37.1 L / 9.8 G
20 ft = 49.6 L / 13.1 G
25 ft = 61.7 L / 16.3 G

Well ID: RE123D1

(continued from front)

Time (24 hr)	Volume Removed (Liters)	Temp (°C)	pH	Spec. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Depth to water (ft)	Color/Odor
1030		19.87	5.08	0.096	7.76	256.2	—	500	46.62	clearing
1035	5 gal	19.84	5.07	0.096	7.68	257.7	13.4	500	46.62	"
1040		19.77	5.06	0.096	7.63	259.4	—	500	46.62	"
1045		19.98	5.04	0.097	7.63	262.4	9.11	500	46.62	clear
1050		19.90	5.05	0.096	7.64	261.7	—	500	46.62	"
1055		19.83	5.04	0.097	7.67	261.6	10.08	500	46.62	"
1100		19.77	5.03	0.096	7.60	262.5	—	500	46.62	"
1105	10 gal	19.77	5.03	0.096	7.66	262.6	9.61	500	46.62	"
1110		20.00	5.03	0.097	7.61	262.6	—	500	46.62	"
1115		20.10	5.03	0.097	7.62	262.8	7.24	500	46.62	"
1120		19.84	5.03	0.096	7.64	261.2	—	500	46.62	"
1125		19.94	5.02	0.097	7.65	262.5	5.26	500	46.62	"
1130	13 gal	20.04	5.02	0.097	7.68	261.5	—	500	46.62	"
1135		19.82	5.01	0.097	7.64	261.9	—	500	46.62	"

RESOLUTION CONSULTANTS

Well ID: RE12302

Low Flow Ground Water Sample Collection Record

Client: Navy NWIRP Bethpage | Date: 9/29/15 | Time: Start 810 am/pm | Finish ____ am/pm
Project No: 60266526
Site Location: MRA Lab
Weather Conds: foggy, overcast 75° | Collector(s): ____

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 660 c. Length of Water Column ____ (a-b) Casing Diameter/Material 4-inch PVC

b. Water Table Depth 49.01 d. Calculated System Volume (see back) 49.6L / 13.1gal

2. WELL PURGE DATA

a. Purge Method: Geotech bladder pump with drop tube assembly

b. Acceptance Criteria defined (see workplan)

- Temperature ± 3% - D.O. ± 10% (values >0.5 mg/L) Turbidity ± 10%
- pH ± 0.1 unit - ORP ± 10mV
- Sp. Cond. ± 3% - Drawdown < 0.3' Remove a minimum 1 screen volume

c. Field Testing Equipment used:

	Make	Model	Serial Number
	YSI	556	RRW 24698
	HANNA	HI9828-03	64518X

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Depth to water (ft)	Color/Odor
910										
950	12L/3g	21.02	5.08	0.030	5.83	265.6		500	49.03	cloudy
1000		21.08	4.73	0.026	6.67	291.0			49.02	/
1005	5gal	21.18	4.49	0.025	7.10	298.7	169			
1010		21.31	4.51	0.025	6.83	302.1				
1015		21.33	4.46	0.025	6.38	305.9	20.2		49.01	
1020		21.38	4.42	0.025	6.16	311.1	27.8		49.03	

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☑	☐	☐
Has required turbidity been reached	☑	☐	☐
Have parameters stabilized	☑	☐	☐

If no or N/A - Explain below.

(continued on back)

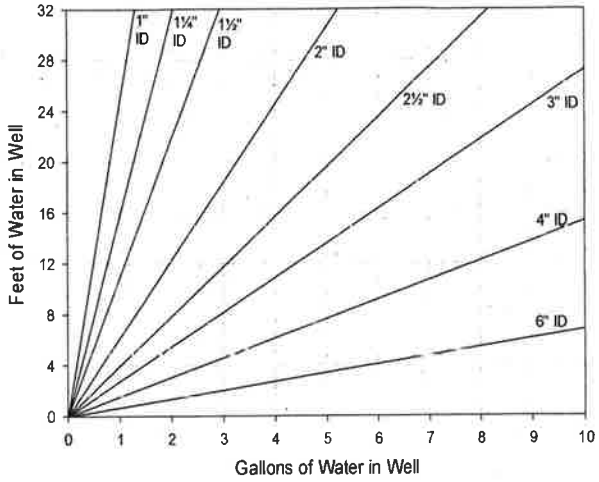
3. SAMPLE COLLECTION: Method: Geotech bladder pump with drop tube assembly

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
RE12302-GW-092915	40-mL vial	3	HCl	VOCs	1110
RE12302-GW-092915	1-L amber	2	none	1,4-Dioxane	1110

Comments: lift bottom with new tubing, lift 15 ft
Liquinox decon

Signature: Paul Kastl Date: 9/29/15

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

1 screen volume

15 ft = 37.1 L / 9.8 G
20 ft = 49.6 L / 13.1 G
25 ft = 61.7 L / 16.3 G

Well ID:

(continued from front)

Time (24 hr)	Volume Removed (Liters)	Temp (°C)	pH	Spec. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Depth to water (ft)	Color/Odor
1025		21.35	4.45	0.025	6.01	311.2	14.5	5000	49.02	
1030		21.34	4.44	0.025	6.02	313.6	13.1		49.04	
1035	10 gal	21.81	4.41	0.025	6.05	315.2	12.2		49.03	
1040		21.55	4.36	0.025	6.52	317.8	11.8		49.03	
1045		21.42	4.40	0.025	6.82	317.9	15.0		49.02	
1050		21.41	4.38	0.025	6.61	320.4			49.02	
1055		21.41	4.33	0.025	6.40	324.7	13.2		49.03	
1100		21.41	4.34	0.025	6.52	324.1			49.02	
1110										Sample

RESOLUTION CONSULTANTS

Well ID: RE123D3

Low Flow Ground Water Sample Collection Record

Client: Navy NWIRP Bethpage | Date: 9/29/15 | Time: Start 810 am/pm | Finish 1125 am/pm
Project No: 60266526
Site Location: MW Lot
Weather Conds: 80°F, muggy | Collector(s): JC

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length 8.40 | c. Length of Water Column _____ (a-b) | Casing Diameter/Material 4-inch PVC

b. Water Table Depth 4.09 | d. Calculated System Volume (see back) 13.1 gal

2. WELL PURGE DATA

a. Purge Method: Geotech bladder pump with drop tube assembly

b. Acceptance Criteria defined (see workplan)

- Temperature	± 3%	- D.O.	± 10% (values >0.5 mg/L)	Turbidity	± 10%
- pH	± 0.1 unit	- ORP	± 10mV		
- Sp. Cond.	± 3%	- Drawdown	< 0.3'	Remove a minimum 1 screen volume	

c. Field Testing Equipment used:

	Make	Model	Serial Number
	YSI	556 MPS	22118
	Hanna	HI 98703	U645184

Time (24hr)	Volume Removed (Liters)	Temp. (°C)	pH	Spec. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Depth to water (ft)	Color/Odor
910		19.26	4.56	0.031	7.35	291.7			49.20	ON
950	5 gal	18.97	4.70	0.044	6.44	105.5		500		
955		18.95	4.69	0.044	6.11	48.4	30.3	500	49.28	cloudy/more
1000		18.98	4.86	0.044	5.77	-25.6			49.29	
1005		19.11	4.94	0.044	2.49	-51.3			49.30	
1010		19.08	5.05	0.044	0.67	-90.1	31.8		49.30	
1015		19.66	5.20	0.044	0.61	-99.7			49.28	

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☒	☐	☐
Has required turbidity been reached	☒	☐	☐
Have parameters stabilized	☒	☐	☐

If no or N/A - Explain below.

(continued on back)

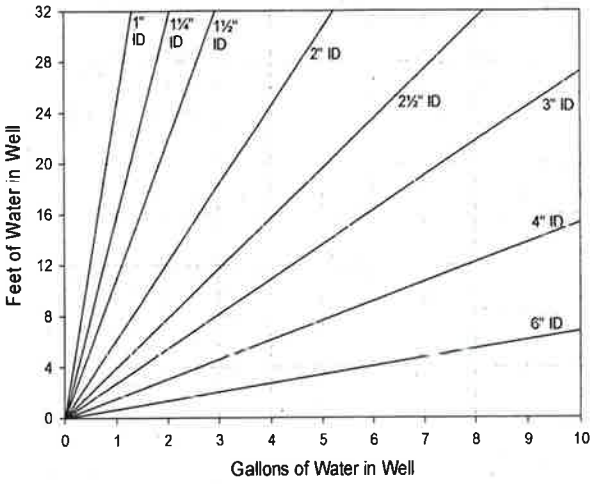
3. SAMPLE COLLECTION: Method: Geotech bladder pump with drop tube assembly

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time
RE123D3-GW-092915	40-mL vial	3	HCl	VOCs	1100
RE123D3-GW-092915	1-L amber	2	none	1,4-Dioxane	1100

Comments: Kit bottom with new tubing
Liquinox decon

Signature _____ Date 9/29/2015

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

1 screen volume

15 ft = 37.1 L / 9.8 G
20 ft = 49.6 L / 13.1 G
25 ft = 61.7 L / 16.3 G

Well ID:

(continued from front)

Time (24 hr)	Volume Removed (Liters)	Temp (°C)	pH	Spec. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Depth to water (ft)	Color/Odor
1020		19.42	5.18	0.043	0.57	-108.0	15.1		49.31	
1025	10 gal	19.31	5.05	0.043	0.54	-107.7				
1030		19.27	4.99	0.042	0.53	-104.1	11.8		49.32	
1035		19.20	5.07	0.042	0.50	-96.7			49.33	
1040		19.57	5.31	0.042	0.49	-117.1	9.87	500	49.32	
1045		19.46	5.11	0.041	0.48	-114.5			49.31	
1050		19.54	5.12	0.041	0.46	-119.0		500	49.31	

Section 4

Analytical Data Validation

DATA VALIDATION REPORT

Project:	Regional Groundwater Investigation — NWIRP Bethpage	
Laboratory:	Katahdin Analytical	
Sample Delivery Groups:	SI4862	
Analyses/Method:	Total Organic Carbon (TOC) by U.S. EPA SW-846 Method 9060A and Standard Method 5310B for Total Organic Carbon by High-Temperature Combustion	
Validation Level:	3	
Project Number:	0888812477.SA.DV	
Prepared by:	Dana Miller/Resolution Consultants	Completed on: 09/15/2015
Reviewed by:	Tina Clemmey/Resolution Consultants	File Name: SI4862_9060A_5310B

SUMMARY

This report summarizes data review findings for samples listed below, collected by Resolution Consultants from the Regional Groundwater Investigation — NWIRP Bethpage site on 6 July 2015 in accordance with the following Sampling and Analysis Plans:

- *Sampling and Analysis Plan, Bethpage, New York.* (Resolution Consultants April 2013).
- *UFP SAP Addendum, Installation of Vertical Profile Borings and Monitoring Wells, Operable Unit 2, NWIRP Bethpage, New York.* (Resolution Consultants November 2013).
- *UFP SAP Addendum, Inclusion of Additional Target Analytes for Volatile Organics Analyses, NWIRP Bethpage OU2, Bethpage, New York*. (Resolution Consultants August 2014).

Sample ID	Lab ID	Matrix/Sample Type	Analysis
RE123D1-070615-488-490	SI4862-2	Soil	9060A
RE123D1-EB-070615	SI4862-1	Equipment Blank	5310B

Data validation activities were conducted using the following guidance documents: *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846, specifically Method 9060A, Total Organic Carbon* (U.S. EPA, 1996), *Method SM5310B, Total Organic Carbon by High-Temperature Combustion, U.S. Environmental Protection Agency (U.S. EPA) Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review* (NFG, January 2010, and Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 4.2 (October 2010). In

the absence of method-specific information, laboratory quality control (QC) limits, project-specific requirements and/or professional judgment were used as appropriate.

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓	Data completeness (chain-of-custody)/sample integrity
✓	Holding times and sample preservation
✓	Gas chromatography/Mass spectrometer performance checks
✓	Initial calibration/continuing calibration verification
✓	Laboratory blanks/equipment blanks/field blanks/trip blanks
NA	Surrogate spike recoveries
NA	Matrix spike and/or matrix spike duplicate results
✓	Laboratory control sample laboratory control sample duplicate results
NA	Field duplicates
NA	Internal standards
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Acceptable data parameters for which all criteria were met and no qualification was performed and non-conformance or other issues that were noted during validation, but did not result in qualification of data are not discussed further.

Qualifications Actions

The data was reviewed independently from the laboratory to assess data quality. All compounds detected at concentrations less than the limit of quantitation but greater than the method detection limit were qualified by the laboratory as estimated (J). This "J" qualifier was retained during data validation. Any sample that was analyzed at a dilution because of high concentrations of target or non-target analytes was checked to confirm that the results and/or sample-specific limit of quantitation and limit of detections were adjusted accordingly by the laboratory.

No results were qualified during this review. Analytical completeness was calculated to be 100% and the data are usable for their intended purpose, according to U.S. Environmental Protection Agency and Department of Defense guidelines. Attachment A provides final results after data review.

ATTACHMENTS

Attachment A: Final Results after Data Review

Attachment A
Final Results after Data Review

			Sample Delivery Group	SI4862	SI4862
			Lab ID	SI4862-1	SI4862-2
			Sample ID	RE123DI-EB-070615	RE123DI-070615-488-490
			Sample Date	7/6/2015	7/6/2015
			Sample Type	Equipment Blank	Soil
Method	**Analyte**	**CAS No**	**Units**		
2540G	TOTAL SOLIDS	-29	PCT	NA	83
5310B	TOTAL ORGANIC CARBON	-28	MG_L	0.12 J	NA
9060A	TOTAL ORGANIC CARBON	-28	UG_G	NA	570

Notes:

ID = Identification
PCT = Percent
MG_L = Milligrams per liter
UG_G = Micrograms per gram
NA = Not analyzed

Final Qualifier:

J = The analyte was positively identified. The numerical value is the estimated concentration of the analyte in the sample.

DATA VALIDATION REPORT

Project:	Regional Groundwater Investigation — NWIRP Bethpage	
Laboratory:	Katahdin Analytical	
Sample Delivery Groups:	SI5844	
Analyses/Method:	Total Organic Carbon (TOC) by U.S. EPA SW-846 Method 9060A and Standard Method 5310B for Total Organic Carbon by High-Temperature Combustion	
Validation Level:	3	
Project Number:	0888812477.SA.DV	
Prepared by:	Dana Miller/Resolution Consultants	Completed on: 09/15/2015
Reviewed by:	Tina Clemmey/Resolution Consultants	File Name: SI5844_9060A_5310B

SUMMARY

This report summarizes data review findings for samples listed below, collected by Resolution Consultants from the Regional Groundwater Investigation — NWIRP Bethpage site on 21 August 2015 in accordance with the following Sampling and Analysis Plans:

- *Sampling and Analysis Plan, Bethpage, New York.* (Resolution Consultants April 2013).
- *UFP SAP Addendum, Installation of Vertical Profile Borings and Monitoring Wells, Operable Unit 2, NWIRP Bethpage, New York.* (Resolution Consultants November 2013).
- *UFP SAP Addendum, Inclusion of Additional Target Analytes for Volatile Organics Analyses, NWIRP Bethpage OU2, Bethpage, New York*. (Resolution Consultants August 2014).

Sample ID	Lab ID	Matrix/Sample Type	Analysis
RE123D2-080315-643-645	SI5844-2	Soil	9060A
RE123D2-EB-080315	SI5844-1	Equipment Blank	5310B

Data validation activities were conducted using the following guidance documents: *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846, specifically Method 9060A, Total Organic Carbon* (U.S. EPA, 1996), *Method SM5310B, Total Organic Carbon by High-Temperature Combustion, U.S. Environmental Protection Agency (U.S. EPA) Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review* (NFG, January 2010, and Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 4.2 (October 2010). In

the absence of method-specific information, laboratory quality control (QC) limits, project-specific requirements and/or professional judgment were used as appropriate.

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓	Data completeness (chain-of-custody)/sample integrity
✓	Holding times and sample preservation
✓	Gas chromatography/Mass spectrometer performance checks
✓	Initial calibration/continuing calibration verification
✓	Laboratory blanks/equipment blanks/field blanks/trip blanks
NA	Surrogate spike recoveries
✓	Matrix spike and/or matrix spike duplicate results
✓	Laboratory control sample laboratory control sample duplicate results
NA	Field duplicates
NA	Internal standards
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Acceptable data parameters for which all criteria were met and no qualification was performed and non-conformance or other issues that were noted during validation, but did not result in qualification of data are not discussed further.

Qualifications Actions

The data was reviewed independently from the laboratory to assess data quality. All compounds detected at concentrations less than the limit of quantitation but greater than the method detection limit were qualified by the laboratory as estimated (J). This "J" qualifier was retained during data validation. Any sample that was analyzed at a dilution because of high concentrations of target or non-target analytes was checked to confirm that the results and/or sample-specific limit of quantitation and limit of detections were adjusted accordingly by the laboratory.

No results were qualified during this review. Analytical completeness was calculated to be 100% and the data are usable for their intended purpose, according to U.S. Environmental Protection Agency and Department of Defense guidelines. Attachment A provides final results after data review.

ATTACHMENTS

Attachment A: Final Results after Data Review

Attachment A
Final Results after Data Review

			Sample Delivery Group	SI5844	SI5844
			Lab ID	SI5844-1	SI5844-2
			Sample ID	RE123D2-EB-080315	RE123D2-080315-643-645
			Sample Date	8/3/2015	8/3/2015
			Sample Type	Equipment Blank	Soil
Method	**Analyte**	**CAS No**	**Units**		
2540G	TOTAL SOLIDS	-29	PCT	NA	82
5310B	TOTAL ORGANIC CARBON	-28	MG_L	0.33 J	NA
9060A	TOTAL ORGANIC CARBON	-28	UG_G	NA	270 J

Notes:

ID = Identification
PCT = Percent
MG_L = Milligrams per liter
UG_G = Micrograms per gram
NA = Not analyzed

Final Qualifier:

J = The analyte was positively identified. The numerical value is the estimated concentration of the analyte in the sample.

DATA VALIDATION REPORT

Project:	Regional Groundwater Investigation — NWIRP Bethpage	
Laboratory:	Katahdin Analytical	
Sample Delivery Groups:	SI6480	
Analyses/Method:	Total Organic Carbon (TOC) by U.S. EPA SW-846 Method 9060A and Standard Method 5310B for Total Organic Carbon by High-Temperature Combustion	
Validation Level:	3	
Project Number:	0888812477.SA.DV	
Prepared by:	Dana Miller/Resolution Consultants	Completed on: 09/15/2015
Reviewed by:	Tina Clemmey/Resolution Consultants	File Name: SI6480_9060A_5310B

SUMMARY

This report summarizes data review findings for samples listed below, collected by Resolution Consultants from the Regional Groundwater Investigation — NWIRP Bethpage site on 21 August 2015 in accordance with the following Sampling and Analysis Plans:

- *Sampling and Analysis Plan, Bethpage, New York.* (Resolution Consultants April 2013).
- *UFP SAP Addendum, Installation of Vertical Profile Borings and Monitoring Wells, Operable Unit 2, NWIRP Bethpage, New York.* (Resolution Consultants November 2013).
- *UFP SAP Addendum, Inclusion of Additional Target Analytes for Volatile Organics Analyses, NWIRP Bethpage OU2, Bethpage, New York*. (Resolution Consultants August 2014).

Sample ID	Lab ID	Matrix/Sample Type	Analysis
RE123D3-082115-818-820	SI6480-1	Soil	9060A
RE123D3-EB-082115	SI6480-2	Equipment Blank	5310B

Data validation activities were conducted using the following guidance documents: *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846, specifically Method 9060A, Total Organic Carbon* (U.S. EPA, 1996), *Method SM5310B, Total Organic Carbon by High-Temperature Combustion, U.S. Environmental Protection Agency (U.S. EPA) Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review* (NFG, January 2010, and Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 4.2 (October 2010). In

the absence of method-specific information, laboratory quality control (QC) limits, project-specific requirements and/or professional judgment were used as appropriate.

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

✓	Data completeness (chain-of-custody)/sample integrity
✓	Holding times and sample preservation
✓	Gas chromatography/Mass spectrometer performance checks
✓	Initial calibration/continuing calibration verification
✓	Laboratory blanks/equipment blanks/field blanks/trip blanks
NA	Surrogate spike recoveries
✓	Matrix spike and/or matrix spike duplicate results
✓	Laboratory control sample laboratory control sample duplicate results
NA	Field duplicates
NA	Internal standards
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. NA indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. Acceptable data parameters for which all criteria were met and no qualification was performed and non-conformance or other issues that were noted during validation, but did not result in qualification of data are not discussed further.

Qualifications Actions

The data was reviewed independently from the laboratory to assess data quality. All compounds detected at concentrations less than the limit of quantitation but greater than the method detection limit were qualified by the laboratory as estimated (J). This "J" qualifier was retained during data validation. Any sample that was analyzed at a dilution because of high concentrations of target or non-target analytes was checked to confirm that the results and/or sample-specific limit of quantitation and limit of detections were adjusted accordingly by the laboratory.

No results were qualified during this review. Analytical completeness was calculated to be 100% and the data are usable for their intended purpose, according to U.S. Environmental Protection Agency and Department of Defense guidelines. Attachment A provides final results after data review.

ATTACHMENTS

Attachment A: Final Results after Data Review

Attachment A
Final Results after Data Review

			Sample Delivery Group	SI6480	SI6480
			Lab ID	SI6480-1	SI6480-2
			Sample ID	RE123D3-082115-818-820	RE123D3-EB-082115
			Sample Date	08/21/2015	08/21/2015
			Sample Type	Soil	Equipment Blank
Method	**Analyte**	**CAS No**	**Units**		
2540G	TOTAL SOLIDS	-29	PCT	85	NA
5310B	TOTAL ORGANIC CARBON	-28	MG_L	NA	0.3 J
9060A	TOTAL ORGANIC CARBON	-28	UG_G	130 J	NA

Notes:

ID = Identification
PCT = Percent
MG_L = Milligrams per liter
UG_G = Micrograms per gram
NA = Not analyzed

Final Qualifier:

J = The analyte was positively identified. The numerical value is the estimated concentration of the analyte in the sample.

DATA VALIDATION REPORT

Project:	Regional Groundwater Investigation — NWIRP Bethpage
Laboratory:	Katahdin Analytical
Sample Delivery Group:	BETHPAGE-2
Analyses/Method:	Volatile Organic Compounds by U.S. EPA SW-846 Method 8260C 1,4-Dioxane by U.S. EPA SW-846 Method 8270D via Selective Ion Monitoring (SIM)
Validation Level:	3
Project Number:	0888812477.SA.DV
Prepared by:	Dana Miller/Resolution Consultants Completed on: 11/30/2015
Reviewed by:	Tina Clemmey/Resolution Consultants File Name: BETHPAGE2_8260C_8270D

SUMMARY

This report summarizes data review findings for samples listed below, collected by Resolution Consultants from the Regional Groundwater Investigation — NWIRP Bethpage Site on 25 and 30 September 2015 in accordance with the following Sampling and Analysis Plans:

- *Sampling and Analysis Plan, Bethpage, New York.* (Resolution Consultants, April 2013).
- *UFP SAP Addendum, Installation of Vertical Profile Borings and Monitoring Wells, Operable Unit 2, NWIRP Bethpage, New York.* (Resolution Consultants, November 2013).
- *UFP SAP Addendum, Inclusion of Additional Target Analytes for Volatile Organics Analyses, NWIRP Bethpage OU2, Bethpage, New York*. (Resolution Consultants, August 2014).

Sample ID	Lab ID	Matrix/Sample Type	Analysis
RE104D1-GW-092515	SI7583-1	Groundwater	8260C/8270D_SIM
RE108D2-GW-092815	SI7583-10	Groundwater	8260C/8270D_SIM
TB01-092815	SI7583-11	Trip Blank	8260C
TB02-092815	SI7583-18RA	Trip Blank	8260C
RE104D2-GW-092515	SI7583-2	Groundwater	8260C/8270D_SIM
RE104D3-GW-092515	SI7583-3	Groundwater	8260C/8270D_SIM
TT309S-GW-092515	SI7583-4	Groundwater	8260C/8270D_SIM
TT309I-GW-092515	SI7583-5	Groundwater	8260C/8270D_SIM
TT309D-GW-092515	SI7583-6	Groundwater	8260C/8270D_SIM
RE105D1-GW-092815	SI7583-7	Groundwater	8260C/8270D_SIM

Sample ID	Lab ID	Matrix/Sample Type	Analysis
RE105D2-GW-092815	SI7583-8	Groundwater	8260C/8270D_SIM
RE108D1-GW-092815	SI7583-9	Groundwater	8260C/8270D_SIM
DUPLICATE-GW-092915	SI7681-10	Duplicate of TT101D-GW-092915	8260C/8270D_SIM
RE122D1-GW-093015	SI7681-11	Groundwater	8260C/8270D_SIM
RE122D2-GW-093015	SI7681-12	Groundwater	8260C/8270D_SIM
RE122D3-GW-093015	SI7681-13	Groundwater	8260C/8270D_SIM
RE103D1-GW-093015	SI7681-14	Groundwater	8260C/8270D_SIM
RE103D2-GW-093015	SI7681-15	Groundwater	8260C/8270D_SIM
RE103D3-GW-093015	SI7681-16	Groundwater	8260C/8270D_SIM
TB01-093015	SI7681-17	Trip Blank	8260C
RE123D1-GW-092915	SI7681-1RA	Groundwater	8260C/8270D_SIM
RE123D2-GW-092915	SI7681-2RA	Groundwater	8260C/8270D_SIM
RE123D3-GW-092915	SI7681-3RA	Groundwater	8260C/8270D_SIM
RE120D1-GW-092915	SI7681-4	Groundwater	8260C/8270D_SIM
RE120D2-GW-092915	SI7681-5	Groundwater	8260C/8270D_SIM
RE120D3-GW-092915	SI7681-6	Groundwater	8260C/8270D_SIM
TT101D-GW-092915	SI7681-7	Groundwater	8260C/8270D_SIM
TT101D1-GW-092915	SI7681-8	Groundwater	8260C/8270D_SIM
TT101D2-GW-092915	SI7681-9	Groundwater	8260C/8270D_SIM

Data validation activities were conducted using the following guidance documents: *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846, specifically Method 8260C, Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry* (United States Environmental Protection Agency [U.S. EPA] 2006), *SW-846 Method 8270D, Semivolatile Organic Compounds by Gas Chromatograph/Mass Spectrometry* (U.S. EPA 2007), *U.S. Environmental Protection Agency Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review* (U.S. EPA, June 2008), and *Department of Defense Quality Systems Manual for Environmental Laboratories*, Version 4.2 (October 2010). In the absence of method-specific information, laboratory quality control (QC) limits, project-specific requirements, and/or professional judgment were used as appropriate.

REVIEW ELEMENTS

The data were evaluated based on the following parameters (where applicable to the method):

- ✓ Data completeness (chain-of-custody)/sample integrity
- ✓ Holding times and sample preservation

✓ Gas chromatography/Mass spectrometer performance checks
✗ Initial calibration verification (ICV)/continuing calibration verification (CCV)
✗ Laboratory blanks/trip blanks
✗ Surrogate spike recoveries
✗ Matrix spike and/or matrix spike duplicate results
✓ Laboratory control sample/laboratory control sample duplicate results
✓ Field duplicates
✓ Internal standards
✓ Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. Acceptable data parameters for which all criteria were met and no qualification was performed and non-conformance or other issues that were noted during validation, but did not result in qualification of data are not discussed further. The symbol (✗) indicates that a QC non-conformance resulted in the qualification of data. Any QC non-conformance that resulted in the qualification of data is discussed below.

RESULTS

Initial Calibration/Continuing Calibration Verification

Calibration data were reviewed for conformance with the QC acceptance criteria to ensure that:

- The initial calibration percent relative standard deviation, correlation coefficient/coefficient of determination, and/or response factor method acceptance criteria were met
- The ICV standard percent recovery acceptance criteria were met
- The CCV method percent difference or percent drift and response factor acceptance criteria were met
- The retention time method acceptance criteria were met

Data qualification to the analytes associated with the specific initial calibration (ICAL) was as follows:

ICAL Linearity Non-conformance:

Criteria	Actions	
	Detected Results	Non-detected Results
%RSD >15% and quantitation based on mean response factor	J	UJ

Notes:
%RSD = Relative standard deviation
J = Estimated
UJ = Undetected and estimated

Data qualification to the analytes associated with the specific ICV was as follows:

ICV Recovery Non-conformance:

Criteria	Actions	
	Detected Results	Non-detected Results
Recovery >120%	J	UJ
Recovery < 80%	J	UJ

Notes:
J = Estimated
UJ = Undetected and estimated

Data qualification to the analytes associated with the specific CCV was as follows:

CCV Linearity Non-conformance:

Criteria	Actions	
	Detected Results	Non-detected Results
%Difference or %Drift > 20%	J	UJ

Notes:
J = Estimated
UJ = Undetected and estimated

ICAL, ICV and CCV non-conformances are summarized in Attachment A in Table's A-1, A-2, and A-3.

Laboratory Blanks/Equipment Blanks/ Field Blanks/Trip Blanks

Laboratory blanks, equipment blanks, field blanks, and trip blanks were analyzed with samples to assess contamination imparted by sample preparation and/or analysis. All results associated with a particular blank were evaluated to determine whether there was an inherent variability in the data, or if a problem was an isolated occurrence that did not affect the data. Samples were flagged in accordance with *Functional Guidelines* (shown below) where detections were not believed to be site-related.

Blank Non-conformance Charts:

For common lab contaminants (methylene chloride, acetone, 2-butanone):			
Blank type	**Blank result**	**Sample result**	**Action for samples**
Method, Storage, Trip, Field, or Equipment	Detects	Not detected	No qualification
	≤ 2x LOQ	< 2x LOQ	Report sample LOQ value with a U
		≥ 2x LOQ and ≤ 4x the LOQ	Report the sample result with a U**
		≥ 4x the LOQ	No qualifications
	> 2x LOQ	< LOD	Report sample LOD value with a U**
		≥ LOD and < 2x LOQ	Report sample LOQ value with a U
		≥ 2x LOQ and < blank contamination	Report the blank result with a U or reject the sample result as unusable R
		≥ 2x LOQ and ≥ blank contamination	If the result is ≤2x blank result, report the sample result U.** If the result is > 2x blank result, no qualification is required.**
****Based on Resolution Consultants professional judgment**			

For all other compounds:			
Blank type	**Blank result**	**Sample result**	**Action for samples**
Method, Storage, Trip, Field, or Equipment	Detects	Not detected	No qualification
	< 2x LOQ	< 2x LOQ	Report sample LOQ value with a U
		≥ 2x LOQ	Use professional judgment
	> 2x LOQ	< 2x LOQ	Report sample LOQ value with a U
		≥ 2x LOQ and < blank contamination	Report the blank result with a U or reject the sample result as unusable R
		≥ 2x LOQ and ≥ blank contamination	If the result is ≤2x blank result, report the sample result U. If the result is > 2x blank result, no qualification is required.
	= 2x LOQ	< 2x LOQ	Report sample LOQ value with a U
		≥ 2x LOQ	Use professional judgment
	Gross contamination	Detects	Qualify results as unusable R

Notes:

LOQ	=	Limit of quantitation
LOD	=	Limit of detection
U	=	Undetected
R	=	Rejected

Lab blank and trip blank non-conformances are summarized in Attachment A in Table's A-4, and A-5.

Surrogate Spike Recoveries

Surrogates provide information needed to assess the accuracy of analyses. Known amounts of surrogate compounds, or compounds which are not likely to be found in the actual samples, are added to each organic sample to check for accuracy. If surrogate percent recoveries (%Rs) are close

to the known concentrations, the reported target compound concentrations are assumed to be accurate. Data qualification on the basis of surrogate recovery was as follows:

Surrogate Recovery Non-conformance Chart:

Criteria	Action	
	Detected	Non-detected
% R > Upper Limit	J	No qualification
20% ≤ %R < Lower Limit	J	UJ
% R < 20%	J	Rejected

Notes:

%R	=	Percent recovery
J	=	Estimated
UJ	=	Undetected and estimated

Surrogate recovery non-conformance is summarized in Attachment A in Table A-6.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

MS/MSDs are generated to provide information about the effect of each sample matrix on the sample preparation and the measurement methodology. MS/MSD percent recoveries (%Rs) assess the effect of the sample matrix on the accuracy of the analytical results and %Rs above the laboratory control limit could indicate a potential high result bias while %Rs below QC limits could indicate a potential low result bias. The relative percent differences (RPDs) between the MS and MSD results are evaluated to assess sample precision. The MS/MSD %Rs and RPDs were reviewed for conformance with the QC acceptance criteria. Data qualification to the analytes associated with the specific MS/MSD non-conformances were as follows:

MS/MSD Non-conformances Chart:

Criteria	Action	
	Detected Compounds	Non-detected Compounds
%R>Upper Limit	J	No qualification
20% ≤ %R < Lower Limit	J	UJ
%R <20%	J	Rejected

Notes:

%R	=	Percent recovery
RPD	=	Relative percent difference
J	=	Estimated
UJ	=	Undetected and estimated

MS/MSD non-conformances are summarized in Attachment A in Table A-7.

Qualifications Actions

The data was reviewed independently from the laboratory to assess data quality. All compounds detected at concentrations less than the limit of quantitation but greater than the method detection limit were qualified by the laboratory as estimated (J). This "J" qualifier was retained during data validation. Any sample that was analyzed at a dilution because of high concentrations of target or non-target analytes was checked to confirm that the results and/or sample-specific limit of quantitation and limit of detections were adjusted accordingly by the laboratory.

No results were rejected; therefore, analytical completeness was calculated to be 100 percent. Data not qualified during data review are considered usable by the project. The remaining results qualified as estimated may be high or low, but the data are usable for their intended purpose, according to U.S. EPA and Department of Defense guidelines. Final data review qualifiers used to describe results and how they should be interpreted by the end data user are provided in Attachment B and Attachment C. Attachment D provides final results after data review.

ATTACHMENTS

Attachment A: Non-Conformance Summary Tables
Attachment B: Qualifier Codes and Explanations
Attachment C: Reason Codes and Explanations
Attachment D: Final Results after Data Review

Attachment A
Non-Conformance Summary Table

Table A-1 Initial Calibration Non-Conformance					
Method	**Analyte**	**%RSD**	**Limit**	**Associated Samples**	**Qualifier**
8260C	Chloromethane	15.21596	<15%	SI7583-1 through S17583-11, S17583-18RA, S17583-10DL, SI7583-8DL	Detects: J Non-detects: UJ
8260C	Bromomethane	15.30744	<15%	SI7583-1 through S17583-11, S17583-18RA, S17583-10DL, SI7583-8DL	Detects: J Non-detects: UJ
8260C	Chloroethane	22.54919	<15%	SI7583-1 through S17583-11, S17583-18RA, S17583-10DL, SI7583-8DL	Detects: J Non-detects: UJ
8260C	Acetone	16.25899	<15%	SI7583-1 through S17583-11, S17583-18RA, S17583-10DL, SI7583-8DL	Detects: J Non-detects: UJ
8260C	Methyl cyclohexane	15.66496	<15%	SI7583-1 through S17583-11, S17583-18RA, S17583-10DL, SI7583-8DL	Detects: J Non-detects: UJ
8260C	2-Hexanone	15.46497	<15%	S17681-14 through S17681-17, S17681-1RA through S17681-3RA, S17681-9DL, S17681-11DL, S17681-12DL,	Detects: J Non-detects: UJ
8260C	O-Xylene	15.32272	<15%	S17681-14 through S17681-17, S17681-1RA through S17681-3RA, S17681-9DL, S17681-11DL, S17681-12DL,	Detects: J Non-detects: UJ
8260C	1,2-Dibromo-3-chloropropane	29.69098	<15%	SI7681-4 through S17681-13, SI7681-14DL through SI7681-16DL	Detects: J Non-detects: UJ

Notes:

%RSD = Relative standard deviation
UJ = Non-detect estimated value
J = Estimated value

Table A-2
Initial Calibration Verification Non-Conformance

Method	Analyte	ICV ID	%R	Limit	Associated Samples	Qualifier
8260C	Dichlorodifluoromethane	WG171044-7	67.47	80-120	SI7583-1 through S17583-11, S17583-18RA, S17583-10DL, SI7583-8DL	Detects: J Non-detects: UJ
8260C	Trichlorofluoromethane	WG171044-7	79.95	80-120	SI7583-1 through S17583-11, S17583-18RA, S17583-10DL, SI7583-8DL	Detects: J Non-detects: UJ
8260C	Carbon Disulfide	WG171044-7	79.65	80-120	SI7583-1 through S17583-11, S17583-18RA, S17583-10DL, SI7583-8DL	Detects: J Non-detects: UJ
8260C	Acetone	WG171044-7	138.88	80-120	SI7583-1 through S17583-11, S17583-18RA, S17583-10DL, SI7583-8DL	Detects: J Non-detects: UJ
8260C	2-Butanone	WG171044-7	159.36	80-120	SI7583-1 through S17583-11, S17583-18RA, S17583-10DL, SI7583-8DL	Detects: J Non-detects: UJ
8260C	4-methyl-2-pentanone	WG171044-7	146.19	80-120	SI7583-1 through S17583-11, S17583-18RA, S17583-10DL, SI7583-8DL	Detects: J Non-detects: UJ
8260C	2-Hexanone	WG171044-7	153.44	80-120	SI7583-1 through S17583-11, S17583-18RA, S17583-10DL, SI7583-8DL	Detects: J Non-detects: UJ
8260C	Carbon Disulfide	WG171658-7	79.48	80-120	S17681-14 through S17681-17, S17681-1RA through S17681-3RA, S17681-9DL, S17681-11DL, S17681-12DL,	Detects: J Non-detects: UJ
8260C	Acetone	WG171658-7	134.34	80-120	S17681-14 through S17681-17, S17681-1RA through S17681-3RA, S17681-9DL, S17681-11DL, S17681-12DL,	Detects: J Non-detects: UJ
8260C	2-Butanone	WG171658-7	143.56	80-120	S17681-14 through S17681-17, S17681-1RA through S17681-3RA, S17681-9DL, S17681-11DL, S17681-12DL,	Detects: J Non-detects: UJ
8260C	4-methyl-2-pentanone	WG171658-7	150.32	80-120	S17681-14 through S17681-17, S17681-1RA through S17681-3RA, S17681-9DL, S17681-11DL, S17681-12DL,	Detects: J Non-detects: UJ
8260C	2-Hexanone	WG171658-7	156.23	80-120	S17681-14 through S17681-17, S17681-1RA through S17681-3RA, S17681-9DL, S17681-11DL, S17681-12DL,	Detects: J Non-detects: UJ
8260C	Dichlorodifluoromethane	WG171660-7	123.49	80-120	SI7681-4 through S17681-13, SI7681-14DL through SI7681-16DL	Detects: J Non-detects: UJ

Notes:

ICV ID = Initial calibration verification identification
ID = Identification
%R = Percent recovery
UJ = Non-detect estimated value
J = Estimated value

Table A-3
Continuing Calibration Verification Non-Conformance

Lab ID /Calibration ID	Analyte	%D	%D Limit	Associated Samples	Qualifier
WG171352-4 / C4922.D	Tetrachloroethene	34.59924	+/- 20	SI7583-1, SI7583-2, SI7583-3, SI7583-4, SI7583-5, SI7583-6, SI7583-7, SI7583-8, SI7583-9, SI7583-10, and SI7583-11	Detects: J Non-detects: UJ
WG171374-4 / C4942.D	Methyl cyclohexane	21.55731	+/- 20	SI7583-18RA, SI7583-10DL, SI7583-8DL, SI7681-17, SI7681-14, SI7681-15, and SI7681-16	Detects: J Non-detects: UJ
WG171659-4 / C5030.D	Tetrachloroethene	-29.10536	+/- 20	SI7681-1RA, SI7681-2RA, SI7681-3RA, SI7681-4DL, SI7681-5DL, SI7681-8RA, SI7681-9DL, SI7681-11DL, SI7681-12DL	Detects: J Non-detects: UJ
WG171660-4 / P3089.D	Dichlorodifluoromethane	41.50045	+/- 20	SI7681-4, SI7681-5, SI7681-6, SI7681-7, SI7681-8, SI7681-9, SI7681-10, SI7681-11, SI7681-12, SI7681-13	Detects: J Non-detects: UJ
WG171601-4 / P3113.D	Dichlorodifluoromethane	40.79053	+/- 20	SI7681-14DL, SI7681-15DL, SI7681-16DL	Detects: J Non-detects: UJ
WG171601-4 / P3113.D	Chloromethane	22.86899	+/- 20	SI7681-14DL, SI7681-15DL, SI7681-16DL	Detects: J Non-detects: UJ
WG171601-4 / P3113.D	Tetrachloroethene	-30.50148	+/- 20	SI7681-14DL, SI7681-15DL, SI7681-16DL	Detects: J Non-detects: UJ

Notes:
ID = Identification
%D = Percent difference
UJ = Non-detect estimated value
J = Detected estimated value

Table A-4
Lab Blank Non-Conformance
(Micrograms per liter)

Blank ID	Analyte	Blank Result	LOQ	Associated Sample	Qualifier
WG171658-9	Carbon Disulfide	0.41	1	TB01-093015	U

Notes:
ID = Identification
LOQ = Limit of quantitation
U = Detected analyte qualified as non-detect due to sample result being less than 2 times the LOQ.

Table A-5
Field Blank Non-Conformance
(Micrograms per liter)

Blank ID	Analyte	Blank Result	LOQ	Associated Sample	Qualifier
TB01-092815	Chloromethane	0.46	2	TT309S-GW-092515	U
TB01-093015	Chloromethane	0.82	2	RE123D2-GW-092915	U
TB01-093015	Chloromethane	0.82	2	RE123D3-GW-092915	U

Notes:
ID = Identification
LOQ = Limit of quantitation
U = Detected analyte qualified as non-detect due to sample result being less than 2 times the LOQ.

Table A-6
Surrogate Non-Conformance

Method	Surrogate	%R	Limits	Associated Sample	Qualifier
8260C	1,2-Dichloroethane-d4	121	70-120	RE103D3-GW-093015	Detects: J
8260C	1,2-Dichloroethane-d4	122	70-120	RE120D1-GW-092915	Detects: J
8260C	1,2-Dichloroethane-d4	124	70-120	RE120D2-GW-092915	Detects: J
8260C	Dibromofluoromethane	81.3	85-115	RE122D1-GW-093015	Detects: J and Non-detects: UJ
8260C	1,2-Dichloroethane-d4	124	70-120	RE122D1-GW-093015	Detects: J
8260C	Dibromofluoromethane	83.4	85-115	RE122D2-GW-093015	Detects: J and Non-detects: UJ
8260C	1,2-Dichloroethane-d4	122	70-120	RE122D2-GW-093015	Detects: J
8260C	Dibromofluoromethane	84.7	85-115	RE122D3-GW-093015	Detects: J and Non-detects: UJ
8260C	Dibromofluoromethane	80.4	85-115	TT101D1-GW-092915	Detects: J and Non-detects: UJ
8260C	1,2-Dichloroethane-d4	122	70-120	TT101D1-GW-092915	Detects: J
8260C	Dibromofluoromethane	84.5	85-115	TT101D2-GW-092915	Detects: J and Non-detects: UJ
8260C	1,2-Dichloroethane-d4	121	70-120	TT101D2-GW-092915	Detects: J

Notes:
%R = Percent recovery
UJ = Non-detect estimated value
J = Detected estimated value

Table A-7
Matrix Spike / Matrix Spike Duplicate Non-Conformance
(Micrograms per liter)

Spiked Sample	Analyte	Sample Result	Spike Added	MS %R	MSD %R	%R Limits	Qualifier
TT101D2-GW-092915	Trichloroethene	640	50.0	**154***	**252***	70-125	J

Notes:
MS = Matrix spike
MSD = Matrix spike duplicate
%R = Percent recovery
Bold* = Percent recovery less than lower control limit
J = Detected analyte in associated sample qualified estimated "J" because %R is greater than control limit in associated sample.

Attachment B
Qualifier Codes and Explanations

Qualifier	Explanation
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual quantitation limit necessary to accurately and precisely measure the analyte in the sample.
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Attachment C
Reason Codes and Explanations

Reason Code	Explanation
be	Equipment blank contamination
bf	Field blank contamination
bl	Laboratory blank contamination
bt	Trip blank contamination
c	Calibration issue
d	Reporting limit raised due to chromatographic interference
fd	Field duplicate relative percent difference
h	Holding times
i	Internal standard areas
k	Estimated Maximum Possible Concentration
l	Laboratory control sample
lc	Labeled compound recovery
ld	Laboratory duplicate relative percent difference
lp	Laboratory control sample/laboratory control sample duplicate relative percent difference
m	Matrix spike recovery
mc	Method compliance non-conformance
md	Matrix spike/matrix spike duplicate relative percent difference
nb	Negative laboratory blank contamination
p	Chemical preservation issue
r	Dual column relative percent difference
q	Quantitation issue
s	Surrogate recovery
su	Ion suppression
t	Temperature preservation issue
x	Percent solids
y	Serial dilution results
z	Interference check sample results (metals)

Attachment D
Final Results after Data Review

		Sample Delivery Group Lab ID Sample ID Sample Date Sample Type		BETHPAGE-2 SI7681-1RA RE123D1-GW-092915 9/29/2015 Groundwater		
Method	**Analyte**	**CAS No**	**Units**	Result	Qual	RC
8260C	1,1,1-TRICHLOROETHANE	71-55-6	UG_L	0.5	U	
8260C	1,1,2,2-TETRACHLOROETHANE	79-34-5	UG_L	0.5	U	
8260C	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	UG_L	0.5	U	
8260C	1,1,2-TRICHLOROETHANE	79-00-5	UG_L	0.5	U	
8260C	1,1-DICHLOROETHANE	75-34-3	UG_L	0.5	U	
8260C	1,1-DICHLOROETHENE	75-35-4	UG_L	0.42	J	
8260C	1,2,4-TRICHLOROBENZENE	120-82-1	UG_L	0.5	U	
8260C	1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	UG_L	0.75	U	
8260C	1,2-DIBROMOETHANE	106-93-4	UG_L	0.5	U	
8260C	1,2-DICHLOROBENZENE	95-50-1	UG_L	0.5	U	
8260C	1,2-DICHLOROETHANE	107-06-2	UG_L	0.5	U	
8260C	1,2-DICHLOROETHENE, TOTAL	540-59-0	UG_L	0.5	J	
8260C	1,2-DICHLOROPROPANE	78-87-5	UG_L	0.5	U	
8260C	1,3-DICHLOROBENZENE	541-73-1	UG_L	0.5	U	
8260C	1,4-DICHLOROBENZENE	106-46-7	UG_L	0.5	U	
8260C	2-BUTANONE	78-93-3	UG_L	2.5	UJ	c
8260C	2-HEXANONE	591-78-6	UG_L	2.5	UJ	c
8260C	4-METHYL-2-PENTANONE	108-10-1	UG_L	2.5	UJ	c
8260C	ACETONE	67-64-1	UG_L	5.4	J	c
8260C	BENZENE	71-43-2	UG_L	0.5	U	
8260C	BROMODICHLOROMETHANE	75-27-4	UG_L	0.5	U	
8260C	BROMOFORM	75-25-2	UG_L	0.5	U	
8260C	BROMOMETHANE	74-83-9	UG_L	1	U	
8260C	CARBON DISULFIDE	75-15-0	UG_L	0.5	UJ	c
8260C	CARBON TETRACHLORIDE	56-23-5	UG_L	0.5	U	
8260C	CHLOROBENZENE	108-90-7	UG_L	0.5	U	
8260C	CHLOROETHANE	75-00-3	UG_L	1	U	
8260C	CHLOROFORM	67-66-3	UG_L	0.5	U	
8260C	CHLOROMETHANE	74-87-3	UG_L	1	U	
8260C	CIS-1,2-DICHLOROETHENE	156-59-2	UG_L	0.5	J	
8260C	CIS-1,3-DICHLOROPROPENE	10061-01-5	UG_L	0.5	U	
8260C	CYCLOHEXANE	110-82-7	UG_L	0.5	U	
8260C	DIBROMOCHLOROMETHANE	124-48-1	UG_L	0.5	U	
8260C	DICHLORODIFLUOROMETHANE	75-71-8	UG_L	1	U	
8260C	ETHYLBENZENE	100-41-4	UG_L	0.5	U	
8260C	ISOPROPYLBENZENE	98-82-8	UG_L	0.5	U	
8260C	M- AND P-XYLENE	108-38-3/106-42	UG_L	1	U	
8260C	METHYL ACETATE	79-20-9	UG_L	0.75	U	
8260C	METHYL CYCLOHEXANE	108-87-2	UG_L	0.5	U	
8260C	METHYL TERT-BUTYL ETHER	1634-04-4	UG_L	0.5	U	
8260C	METHYLENE CHLORIDE	75-09-2	UG_L	2.5	U	
8260C	O-XYLENE	95-47-6	UG_L	0.5	UJ	c
8260C	STYRENE	100-42-5	UG_L	0.5	U	
8260C	TETRACHLOROETHENE	127-18-4	UG_L	3.8	J	c
8260C	TOLUENE	108-88-3	UG_L	0.5	U	
8260C	TRANS-1,2-DICHLOROETHENE	156-60-5	UG_L	0.5	U	
8260C	TRANS-1,3-DICHLOROPROPENE	10061-02-6	UG_L	0.5	U	
8260C	TRICHLOROETHENE	79-01-6	UG_L	12		
8260C	TRICHLOROFLUOROMETHANE	75-69-4	UG_L	1	U	
8260C	VINYL CHLORIDE	75-01-4	UG_L	1	U	
8260C	XYLENES, TOTAL	1330-20-7	UG_L	1.5	U	
8270D_SIM	1,4-DIOXANE	123-91-1	UG_L	6.6		

		Sample Delivery Group Lab ID Sample ID Sample Date Sample Type		BETHPAGE-2 SI7681-2RA RE123D2-GW-092915 9/29/2015 Groundwater		
Method	**Analyte**	**CAS No**	**Units**	Result	Qual	RC
8260C	1,1,1-TRICHLOROETHANE	71-55-6	UG_L	0.5	U	
8260C	1,1,2,2-TETRACHLOROETHANE	79-34-5	UG_L	0.5	U	
8260C	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	UG_L	0.5	U	
8260C	1,1,2-TRICHLOROETHANE	79-00-5	UG_L	0.5	U	
8260C	1,1-DICHLOROETHANE	75-34-3	UG_L	0.5	U	
8260C	1,1-DICHLOROETHENE	75-35-4	UG_L	0.5	U	
8260C	1,2,4-TRICHLOROBENZENE	120-82-1	UG_L	0.5	U	
8260C	1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	UG_L	0.75	U	
8260C	1,2-DIBROMOETHANE	106-93-4	UG_L	0.5	U	
8260C	1,2-DICHLOROBENZENE	95-50-1	UG_L	0.5	U	
8260C	1,2-DICHLOROETHANE	107-06-2	UG_L	0.5	U	
8260C	1,2-DICHLOROETHENE, TOTAL	540-59-0	UG_L	1	U	
8260C	1,2-DICHLOROPROPANE	78-87-5	UG_L	0.5	U	
8260C	1,3-DICHLOROBENZENE	541-73-1	UG_L	0.5	U	
8260C	1,4-DICHLOROBENZENE	106-46-7	UG_L	0.5	U	
8260C	2-BUTANONE	78-93-3	UG_L	2.5	UJ	c
8260C	2-HEXANONE	591-78-6	UG_L	2.5	UJ	c
8260C	4-METHYL-2-PENTANONE	108-10-1	UG_L	2.5	UJ	c
8260C	ACETONE	67-64-1	UG_L	2.5	UJ	c
8260C	BENZENE	71-43-2	UG_L	0.5	U	
8260C	BROMODICHLOROMETHANE	75-27-4	UG_L	0.5	U	
8260C	BROMOFORM	75-25-2	UG_L	0.5	U	
8260C	BROMOMETHANE	74-83-9	UG_L	1	U	
8260C	CARBON DISULFIDE	75-15-0	UG_L	0.5	UJ	c
8260C	CARBON TETRACHLORIDE	56-23-5	UG_L	0.5	U	
8260C	CHLOROBENZENE	108-90-7	UG_L	0.5	U	
8260C	CHLOROETHANE	75-00-3	UG_L	1	U	
8260C	CHLOROFORM	67-66-3	UG_L	0.5	U	
8260C	CHLOROMETHANE	74-87-3	UG_L	1	UJ	bt
8260C	CIS-1,2-DICHLOROETHENE	156-59-2	UG_L	0.5	U	
8260C	CIS-1,3-DICHLOROPROPENE	10061-01-5	UG_L	0.5	U	
8260C	CYCLOHEXANE	110-82-7	UG_L	0.5	U	
8260C	DIBROMOCHLOROMETHANE	124-48-1	UG_L	0.5	U	
8260C	DICHLORODIFLUOROMETHANE	75-71-8	UG_L	1	U	
8260C	ETHYLBENZENE	100-41-4	UG_L	0.5	U	
8260C	ISOPROPYLBENZENE	98-82-8	UG_L	0.5	U	
8260C	M- AND P-XYLENE	108-38-3/106-42	UG_L	1	U	
8260C	METHYL ACETATE	79-20-9	UG_L	0.75	U	
8260C	METHYL CYCLOHEXANE	108-87-2	UG_L	0.5	U	
8260C	METHYL TERT-BUTYL ETHER	1634-04-4	UG_L	0.5	U	
8260C	METHYLENE CHLORIDE	75-09-2	UG_L	2.5	U	
8260C	O-XYLENE	95-47-6	UG_L	0.5	UJ	c
8260C	STYRENE	100-42-5	UG_L	0.5	U	
8260C	TETRACHLOROETHENE	127-18-4	UG_L	3.7	J	c
8260C	TOLUENE	108-88-3	UG_L	0.5	U	
8260C	TRANS-1,2-DICHLOROETHENE	156-60-5	UG_L	0.5	U	
8260C	TRANS-1,3-DICHLOROPROPENE	10061-02-6	UG_L	0.5	U	
8260C	TRICHLOROETHENE	79-01-6	UG_L	1.4		
8260C	TRICHLOROFLUOROMETHANE	75-69-4	UG_L	1	U	
8260C	VINYL CHLORIDE	75-01-4	UG_L	1	U	
8260C	XYLENES, TOTAL	1330-20-7	UG_L	1.5	U	
8270D_SIM	1,4-DIOXANE	123-91-1	UG_L	0.93		

		Sample Delivery Group Lab ID Sample ID Sample Date Sample Type		BETHPAGE-2 SI7681-3RA RE123D3-GW-092915 9/29/2015 Groundwater		
Method	**Analyte**	**CAS No**	**Units**	Result	Qual	RC
8260C	1,1,1-TRICHLOROETHANE	71-55-6	UG_L	0.5	U	
8260C	1,1,2,2-TETRACHLOROETHANE	79-34-5	UG_L	0.5	U	
8260C	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	UG_L	0.5	U	
8260C	1,1,2-TRICHLOROETHANE	79-00-5	UG_L	0.5	U	
8260C	1,1-DICHLOROETHANE	75-34-3	UG_L	0.5	U	
8260C	1,1-DICHLOROETHENE	75-35-4	UG_L	0.5	U	
8260C	1,2,4-TRICHLOROBENZENE	120-82-1	UG_L	0.5	U	
8260C	1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	UG_L	0.75	U	
8260C	1,2-DIBROMOETHANE	106-93-4	UG_L	0.5	U	
8260C	1,2-DICHLOROBENZENE	95-50-1	UG_L	0.5	U	
8260C	1,2-DICHLOROETHANE	107-06-2	UG_L	0.5	U	
8260C	1,2-DICHLOROETHENE, TOTAL	540-59-0	UG_L	1	U	
8260C	1,2-DICHLOROPROPANE	78-87-5	UG_L	0.5	U	
8260C	1,3-DICHLOROBENZENE	541-73-1	UG_L	0.5	U	
8260C	1,4-DICHLOROBENZENE	106-46-7	UG_L	0.5	U	
8260C	2-BUTANONE	78-93-3	UG_L	2.5	UJ	c
8260C	2-HEXANONE	591-78-6	UG_L	2.5	UJ	c
8260C	4-METHYL-2-PENTANONE	108-10-1	UG_L	2.5	UJ	c
8260C	ACETONE	67-64-1	UG_L	2.5	UJ	c
8260C	BENZENE	71-43-2	UG_L	0.5	U	
8260C	BROMODICHLOROMETHANE	75-27-4	UG_L	0.5	U	
8260C	BROMOFORM	75-25-2	UG_L	0.5	U	
8260C	BROMOMETHANE	74-83-9	UG_L	1	U	
8260C	CARBON DISULFIDE	75-15-0	UG_L	0.5	UJ	c
8260C	CARBON TETRACHLORIDE	56-23-5	UG_L	0.5	U	
8260C	CHLOROBENZENE	108-90-7	UG_L	0.5	U	
8260C	CHLOROETHANE	75-00-3	UG_L	1	U	
8260C	CHLOROFORM	67-66-3	UG_L	0.5	U	
8260C	CHLOROMETHANE	74-87-3	UG_L	1	UJ	bt
8260C	CIS-1,2-DICHLOROETHENE	156-59-2	UG_L	0.5	U	
8260C	CIS-1,3-DICHLOROPROPENE	10061-01-5	UG_L	0.5	U	
8260C	CYCLOHEXANE	110-82-7	UG_L	0.5	U	
8260C	DIBROMOCHLOROMETHANE	124-48-1	UG_L	0.5	U	
8260C	DICHLORODIFLUOROMETHANE	75-71-8	UG_L	1	U	
8260C	ETHYLBENZENE	100-41-4	UG_L	0.5	U	
8260C	ISOPROPYLBENZENE	98-82-8	UG_L	0.5	U	
8260C	M- AND P-XYLENE	108-38-3/106-42	UG_L	1	U	
8260C	METHYL ACETATE	79-20-9	UG_L	0.75	U	
8260C	METHYL CYCLOHEXANE	108-87-2	UG_L	0.5	U	
8260C	METHYL TERT-BUTYL ETHER	1634-04-4	UG_L	0.5	U	
8260C	METHYLENE CHLORIDE	75-09-2	UG_L	2.5	U	
8260C	O-XYLENE	95-47-6	UG_L	0.5	UJ	c
8260C	STYRENE	100-42-5	UG_L	0.5	U	
8260C	TETRACHLOROETHENE	127-18-4	UG_L	0.5	UJ	c
8260C	TOLUENE	108-88-3	UG_L	0.5	U	
8260C	TRANS-1,2-DICHLOROETHENE	156-60-5	UG_L	0.5	U	
8260C	TRANS-1,3-DICHLOROPROPENE	10061-02-6	UG_L	0.5	U	
8260C	TRICHLOROETHENE	79-01-6	UG_L	0.5	U	
8260C	TRICHLOROFLUOROMETHANE	75-69-4	UG_L	1	U	
8260C	VINYL CHLORIDE	75-01-4	UG_L	1	U	
8260C	XYLENES, TOTAL	1330-20-7	UG_L	1.5	U	
8270D_SIM	1,4-DIOXANE	123-91-1	UG_L	0.17	U	

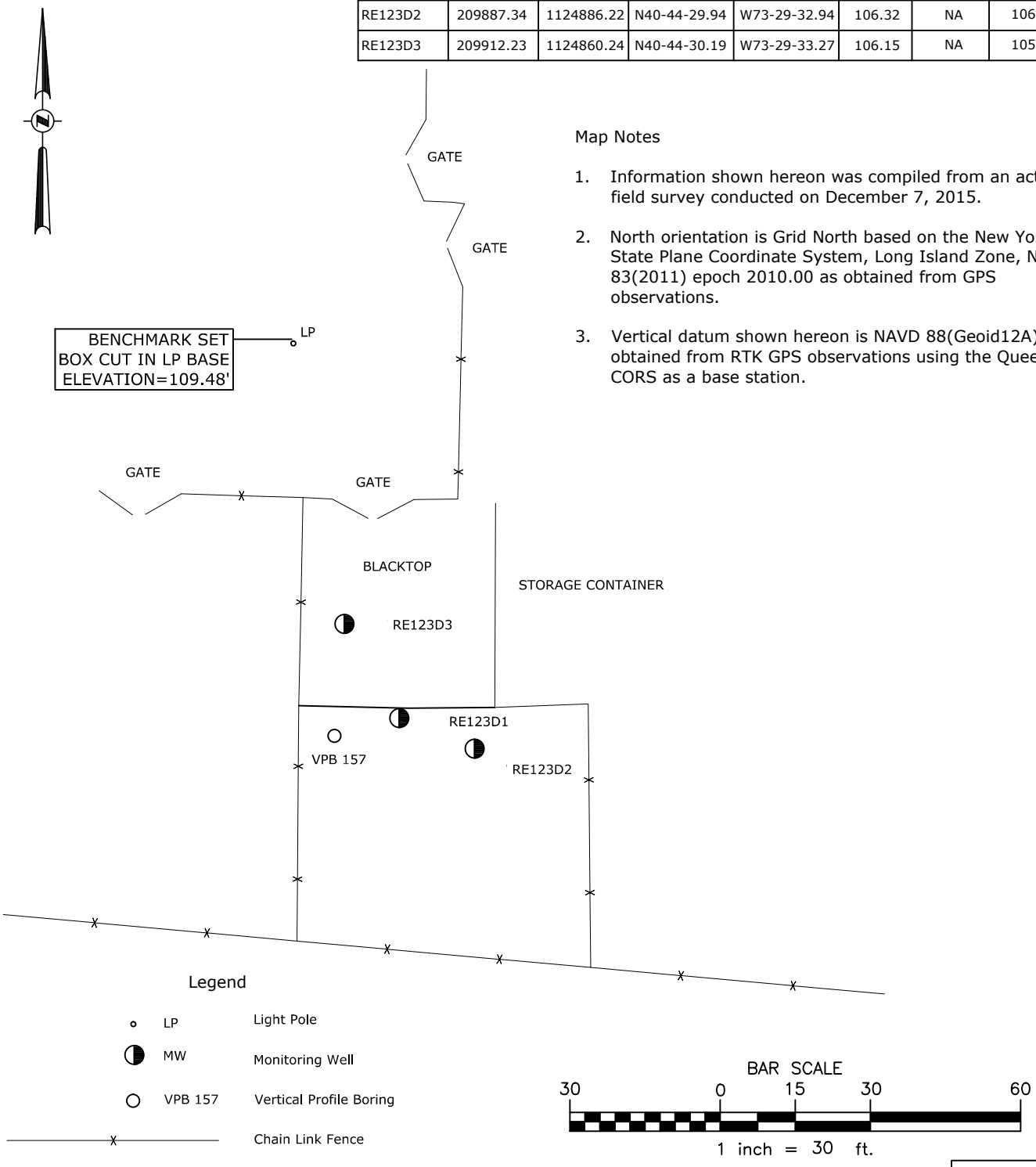
Section 5

Survey

NONE :XREFS

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DOCUMENT IS A VIOLATION OF SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

Description	Northing	Easting	Latitude	Longitude	Ground	Rim	PVC
VPB 157	209889.90	1124858.22	N40-44-29.97	W73-29-33.30	106.01	NA	NA
RE123D1	209894.44	1124871.20	N40-44-30.00	W73-29-33.13	105.93	NA	105.49
RE123D2	209887.34	1124886.22	N40-44-29.94	W73-29-32.94	106.32	NA	106.11
RE123D3	209912.23	1124860.24	N40-44-30.19	W73-29-33.27	106.15	NA	105.92



Map Notes

1. Information shown hereon was compiled from an actual field survey conducted on December 7, 2015.
2. North orientation is Grid North based on the New York State Plane Coordinate System, Long Island Zone, NAD 83(2011) epoch 2010.00 as obtained from GPS observations.
3. Vertical datum shown hereon is NAVD 88(Geoid12A) as obtained from RTK GPS observations using the Queens CORS as a base station.

DWG NO. 15-660

Date	RECORD OF WORK	Appr.

Drafter: LMK	Checker: JFC
Appr. by: JFC	Proj. No. 14.4121

VERTICAL PROFILE BORING 157 SURVEY LOCATION
PARKING LOT OFF OF SUNBEAM AVE.

TOWN OF BETHPAGE | NASSAU COUNTY, NEW YORK

C.T. MALE ASSOCIATES
Engineering, Surveying, Architecture & Landscape Architecture, D.P.C.
50 CENTURY HILL DRIVE, LATHAM, NY 12110
518.786.7400 * FAX 518.786.7299

SCALE: 1"=30' | DATE: DECEMBER 7, 2015

CAD DWG. FILE NAME: K:\Projects\144121\Survey\Drawings and Maps\VPB 157.dwg